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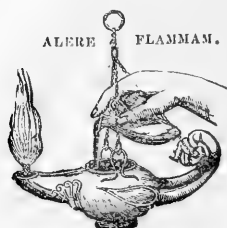
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"Omnes res creatæ sunt divinæ sapientiæ et potentiæ testes, divitiæ felicitatis humanæ:—ex harum usu *bonitas* Creatoris; ex pulchritudine *sapientia* Domini; ex œconomiâ in conservatione, proportionè, renovatione, *potentia* majestatis elucet. Earum itaque indagatio ab hominibus sibi relictis semper æstinuata; à verè eruditis et sapientibus semper exulta; malè doctis et barbaris semper inimica fuit."—LINNÆUS.

"Quel que soit le principe de la vie animale, il ne faut qu'ouvrir les yeux pour voir qu'elle est le chef-d'œuvre de la Toute-puissance, et le but auquel se rapportent toutes ses opérations."—BRUCKNER, *Théorie du Système Animal*, Leyden, 1767.

. . . . . The sylvan powers  
Obey our summons; from their deepest dells  
The Dryads come, and throw their garlands wild  
And odorous branches at our feet; the Nymphs  
That press with nimble step the mountain-thyme  
And purple heath-flower come not empty-handed,  
But scatter round ten thousand forms minute  
Of velvet moss or lichen, torn from rock  
Or rifted oak or cavern deep: the Naiads too  
Quit their loved native stream, from whose smooth face  
They crop the lily, and each sedge and rush  
That drinks the rippling tide: the frozen poles,  
Where peril waits the bold adventurer's tread,  
The burning sands of Borneo and Cayenne,  
All, all to us unlock their secret stores  
And pay their cheerful tribute.

J. TAYLOR, *Norwich*, 1818.



This *Oithona* was tolerably frequent in all the three marine tow-net samples already mentioned, and was the only one observed. In this species the rostrum is short, stout, and hook-like, and is turned downward at nearly a right angle (fig. 12).

This species has frequently been recorded under the name of *Oithona similis*, but, according to Prof. G. O. Sars, *O. similis* and *O. helgolandica* are identical, and the latter, being the older name, should be preferred.

The distribution of *Oithona helgolandica* extends apparently from the Arctic to the Antarctic Oceans. Dr. Giesbrecht records it from 71° south latitude, and Prof. G. O. Sars has examined specimens collected off the coast of New Zealand, and "compared them with northern specimens, without being able to detect any difference whatever"\*. The Falkland specimens measured fully 1 mm. in length.

### Fam. Cyclopidae.

Genus *Cyclops*, Müller, 1776 (part.).

*Cyclops prasinus*, Fischer. (Pl. II. figs. 5-7.)

1860. *Cyclops prasinus*, Fischer, Beitr. z. Kenntn. d. Entomostraceen, pp. 652-654, Taf. xx. figs. 19-26 a.

This species occurred very sparingly in a gathering from a small fresh-water pond near the sea. Besides the northern distribution of the species, it has also been reported from Valdivia, Chile, and from the Argentine. In this species the antennules are twelve-jointed and the fifth pair of legs in the female are each provided with three elongated setæ (fig. 6). The caudal segments are tolerably short (fig. 7).

*Cyclops michaelsoni*, Mrazek, var. *falklandi*.  
(Pl. I. fig. 3 ; Pl. II. figs. 8, 9.)

The small *Cyclops* recorded under this name occurred in several of the fresh-water gatherings from the Falklands.

This form is apparently identical with *Cyclops michaelsoni*, Mrazek, except in the structure of the last pair of thoracic legs, and in this respect it agrees better with *Cyclops lobulosus*, Ekman. In that species, however, the antennules are described as consisting of twelve joints, and the proportional lengths of the various joints also differ. Both *Cyclops michaelsoni*, Mrazek, and *Cyclops lobulosus*, Ekman, have already been recorded for the Falkland Islands. In the

\* 'Crustacea of Norway,' vol. vi. parts 1 & 2, p. 9 (1913).

form under consideration the antennules (fig. 8) consist of eleven joints, the proportional lengths of which are, approximately, as shown in the formula appended:—

|                         |    |   |    |   |   |   |    |    |   |    |    |
|-------------------------|----|---|----|---|---|---|----|----|---|----|----|
| Number of the joints .. | 1  | 2 | 3  | 4 | 5 | 6 | 7  | 8  | 9 | 10 | 11 |
| Proportional lengths .. | 20 | 6 | 12 | 5 | 4 | 7 | 13 | 11 | 6 | 8  | 11 |

In the fifth pair of thoracic legs the basal joint is moderately short and broad and carries a long seta on its outer distal angle, the second joint is small and is furnished at the apex with a long seta and a short spine (Pl. I. fig. 3); a considerable space occurs between the seta at the distal angle of the basal joint and the point of attachment of the second joint, as shown in the figure. The caudal segments are fully twice as long as the last segment of the abdomen (Pl. II. fig. 9).

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## EXPLANATION OF THE PLATES.

## PLATE I.

- Fig. 1.* *Pseudoboeckella brevicaudata* (Mrazek), ♂, fifth feet.  
*Fig. 2.* *Pseudoboeckella vallentini*, sp. n., ♂, fifth feet.  
*Fig. 3.* *Cyclops michaelsoni*, var. *falklandi*, nov. var., ♀, fifth foot.  
*Fig. 4.* *Boeckella michaelsoni* (Mrazek), ♀, fifth foot.  
*Fig. 5.* " " " ♂, fifth feet.  
*Fig. 6.* " " " ♂ (juv.), fifth feet.  
*Fig. 7.* *Pseudoboeckella brevicaudata* (Mrazek), ♀, fifth foot.  
*Fig. 8.* *Pseudoboeckella vallentini*, sp. n., ♀, fifth foot.  
*Fig. 9.* *Pseudoboeckella poppei*, Mrazek, ♂, fifth feet.  
*Fig. 10.* *Pseudoboeckella brevicaudata* (Mrazek), ♀ posterior thoracic segments and abdomen.  
*Fig. 11.* *Pseudoboeckella vallentini*, sp. n., posterior thoracic segments and abdomen.  
*Fig. 12.* *Oithona helyolandica*, Claus, ♀, rostrum

## PLATE II.

- Fig. 1.* *Parabroteas sars* (D day), ♀, × 15.  
*Fig. 2.* " " ♀, second maxilliped.  
*Fig. 3.* " " ♀, first foot.  
*Fig. 4.* " " ♀, fifth foot.  
*Fig. 5.* *Cyclops prasinus*, Fischer, ♀, antennule.  
*Fig. 6.* " " " ♀, fifth foot.  
*Fig. 7.* " " " ♀, abdomen.  
*Fig. 8.* *Cyclops michaelsoni*, Mrazek, var. *falklandi*, var. nov., ♀, antennule.  
*Fig. 9.* Ditto, ♀, abdomen.  
*Fig. 10.* *Drepanopus pectinatus*, G. S. Brady, ♀, fifth feet.  
*Fig. 11.* " " " ♂, fifth feet.

II.—*Diagnoses of new Marine Fishes collected by the British Antarctic ('Terra Nova') Expedition.* By C. TATE REGAN, M.A.

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## 1. ANTARCTIC FISHES.

*Paraliparis antarcticus*, sp. n.

D. 60. A. 55. P. 19 + 3-4 + 4-5. Teeth villiform, in

bands. Lower end of gill-opening opposite middle of base of pectoral. Anal origin below about ninth ray of dorsal.

Total length 140 mm.

S. of Balleny Is., 200 fathoms.

*Trematomus pennellii*, sp. n.

D. V-VI, 32-34. A. 30. Scales 52-56; in upper lateral line 32 to 36. Eye  $3\frac{1}{4}$  to  $3\frac{1}{2}$  in head, interorbital width 8 to 10. Scales on head as in *T. hansonii*, from which this species differs in the fewer scales and fin-rays.

Total length 100-140 mm.

Off C. Adare, 45-50 fathoms.

*Trematomus centronotus*, sp. n.

D. V-VI, 32-35. A. 29-32. Scales 50-56; in upper lateral line 30 to 36. Closely related to *T. pennellii*; eye a little larger and interorbital width a little less, but especially distinguished by having the dorsal spines stiff and pungent.

Total length 175-210 mm.

McMurdo Sound, 100-200 fathoms.

*Trematomus eulepidotus*, sp. n.

D. VI, 35-36. A. 33-34. Scales 70; in upper lateral line 42 to 46, in lower 10 to 15. Eye  $3\frac{1}{2}$  in head, interorbital width 5. Head covered with scales, only the lips naked.

Total length 140-165 mm.

McMurdo Sound, 160-241 fathoms.

*Artedidraco orianæ*, sp. n.

D. III-IV, 25. A. 17-18. Depth 5 to  $5\frac{1}{2}$  in length, head  $2\frac{2}{3}$  to 3. Barbel club-shaped,  $\frac{1}{4}$  length of head. Soft dorsal highest anteriorly.

Total length 80 mm.

Off C. Adare, 45-50 fathoms.

*Dolloidraco velifer*, sp. n.

D. II-III, 26. A. 17. Depth 4 in length, head  $2\frac{2}{3}$ . Barbel long, fringed distally. Anterior rays of soft dorsal  $\frac{3}{4}$  to  $\frac{9}{16}$  length of head.

Total length 180-190 mm.

McMurdo Sound, 207 fathoms.

## POGONOPHRYNE, gen. nov.

Near *Artedidraco*, but head with blunt knobs and ridges, broad, strongly depressed; interorbital region wide.

*Pogonophryne scotti*, sp. n.

D. II, 25. A. 18. Head as broad as long,  $\frac{2}{5}$  length of fish. Barbel blunt, shorter than eye, which is  $5\frac{1}{2}$  in head; interorbital width  $4\frac{1}{2}$ .

Total length 290 mm.

Ross Sea, 158 fathoms.

## PRIONODRACO, gen. nov.

Related to *Bathhydraco*, but body quadrangular and almost naked except for 4 series of V-shaped serrated bony plates, each plate with a retrorse spine; the series of plates margin the flattish dorsal and ventral surfaces of the body. Lateral line single, incomplete.

*Prionodraco evansii*, sp. n.

D. 34-37. A. 29-31. About 50 plates in upper series. Eye 3 to  $3\frac{1}{2}$  in head, interorbital width 15 or more.

Total length to 132 mm.

Ross Sea and McMurdo Sound, 158-207 fathoms.

*Cryodraco atkinsoni*, sp. n.

D. III, 42. A. 46. Head  $3\frac{1}{4}$  in length. Eye 5 in head, interorbital width  $4\frac{2}{3}$ . Pelvics  $1\frac{1}{3}$  as long as head.

Total length 292 mm.

Ross Sea, 158 fathoms.

*Chionodraco kathleenæ*, sp. n.

D. VI-VII, 38-42. A. 34-38. Eye 5 to 6 in length of head, interorbital width  $3\frac{1}{2}$  to 4. Pelvic fins reaching anal.

Total length 250-500 mm.

Ross Sea and McMurdo Sound, 100-200 fathoms.

## CHÆNODRACO, gen. nov.

Differs from *Chionodraco* in that each pelvic fin has a spine and only 4 soft rays, and also in that the supraorbital ridges are not crenulated and the gill-rakers are developed as toothed projections.

*Chaenodraco wilsoni*, sp. n.

D. VII, 39. A. 33. Snout  $2\frac{2}{5}$ , eye 4, interorbital width  $3\frac{2}{3}$  in head, which is  $3\frac{1}{6}$  in length of fish. Dorsals continuous at base. A large dark spot on spinous dorsal.

Total length 250 mm.

McMurdo Sound, 100–200 fathoms.

*Chaenodraco fasciatus*, sp. n.

D. VII, 40. A. 34. Snout  $2\frac{1}{4}$ , eye  $4\frac{1}{8}$ , interorbital width  $4\frac{1}{4}$  in head, which is  $2\frac{2}{3}$  in length of fish. Dorsals separate. Body with 5 blackish cross-bars.

Total length 92 mm.

McMurdo Sound, 207 fathoms.

## 2. FISHES FROM NEW ZEALAND.

*Idiacanthus niger*, sp. n.

D. 59; origin above posterior part of pelvic fins, when these are laid back. A. 38; origin a little nearer caudal than base of pelvics. Photophores in ventral series from isthmus to pelvics about 37, from pelvics to anal 21. Barbel twice as long as head.

Total length 400 mm.

## NOTOPOGON, gen. nov.

Differs from *Macrorhamphosus* in the dorsal fins continuous at base, the third to seventh spines nearly equidistant and gradually decreasing backwards, the deeper body, and the presence in adults of a patch of bristles on the back behind the head. Only 3 large plates in each dorso-lateral series.

*Notopogon lilliei*, sp. n.

D. VII, 14, second spine strong, above middle of anal. A. 19. Distance from base of dorsal spine to vent about  $\frac{2}{3}$  that from head to caudal fin.

Total length 125 mm.

*Notopogon xenosoma*, sp. n.

D. VII, 15, second spine rather slender, inserted above caudal peduncle. A. 17. Distance from base of dorsal spine to vent rather more than that from head to caudal fin.

Total length 80 mm.

Cape North, 70 fathoms.

## SERRANOPS, gen. nov.

Related to *Plectranthias*, Bleek., but serrations of lower præopercular limb weak, not antrorse, and scales spinulose.

*Serranops maculicauda*, sp. n.

D. X 15. A. III 7. Lateral line 33–34. 16 gill-rakers on lower part of anterior arch. Maxillary naked, extending to below middle or posterior part of eye. Eye 3, interorbital width 6 in head. A large dark spot on each side of caudal peduncle.

Total length 60–100 mm.

Cape North, 70 fathoms.

## LEPIDOPERCA, gen. nov.

Externally differs from *Cæsioperca* in the flat interorbital region, truncate caudal, and larger scales. No transverse ridge in front of occipital crest; mucous canals of frontals bordering a narrow groove, which does not broaden out in front.

*Lepidoperca inornata*, sp. n.

D. X 16. A. III 8. Lateral line 41. Near *L. coatsii* (*Cæsioperca coatsii*, Regan, 1913), but mouth smaller, præorbital scaly, body deeper, last dorsal spine higher, dorsal fin immaculate.

Total length 135 mm.

Cape North, 70 fathoms.

*Hemerocætes pauciradiatus*, sp. n.

D. 36. A. 32. Scales 45. Eye  $3\frac{1}{3}$  to  $3\frac{2}{3}$  in length of head.

Total length 50–62 mm.

Cape North, 70 fathoms.

*Hemerocætes macrophthalmus*, sp. n.

D. 39. A. 36. Scales 47. Eye  $2\frac{2}{3}$  to 3 in length of head.

Total length 91–120 mm.

Cape North, 70 fathoms.

*Cubiceps cæruleus*, sp. n.

D. XI, I 23. A. III 21. Probably not more than 50

scales in a lateral series. Depth  $3\frac{2}{5}$  to  $3\frac{3}{5}$  in length. Eye  $3\frac{1}{2}$  to  $3\frac{3}{5}$  in head. Pectoral as long as head, extending to origin of anal. Bluish.

Total length 100–110 mm.

Three Kings Is.

#### CYNOPHIDIUM, gen. nov.

Differs from *Snyderidia*, Gilb., 1905, in the presence of pelvic fins; these are a pair of simple filaments, jugular in position.

#### *Cynophidium punctatum*, sp. n.

Depth nearly equal to head, which is 6 in length of fish. Origin of dorsal slightly in advance of vent. Pelvics  $\frac{1}{2}$  head or  $\frac{1}{2}$  distance from their base to origin of anal. Olivaceous, powdered with little dark spots.

Total length 185 mm.

Cape North, 70 fathoms.

#### *Arnoglossus mongonuiensis*, sp. n.

D. 86–90; second to fifth rays prolonged in ♂. A. 72–76. Scales 70. Depth  $2\frac{1}{2}$  to  $2\frac{3}{4}$  in length, head 4 to  $4\frac{1}{2}$ . Eyes close together, 3 to  $3\frac{1}{2}$  in head. Maxillary extending to anterior edge of eye.

Total length 75–85 mm.

Cape North, 14–30 fathoms.

### 3. FISHES FROM BRAZIL.

#### *Malacorhina cirrifer*, sp. n.

Very similar to *M. mira*, Garm., allowing for differences due to sex and size, this being a young female. Distance between nostrils less than that of either from edge of disc.

Total length 220 mm.

Cape Frio, 40 fathoms.

#### *Prionotus brachychir*, sp. n.

D. VIII–XI, 10–12. A. 10–12. Scales 50 to 60, 45 to 50 in lateral line. Strong opercular and præopercular spines, but no other spines on head. Maxillary extending to below anterior  $\frac{1}{4}$  of eye. Interorbital space a little concave,  $\frac{2}{5}$  diameter of eye, which is equal to snout or postorbital length of head. Second or third dorsal spine longest,  $\frac{1}{2}$  head. Pectoral shorter than head.

Total length 70–80 mm.

Cape Frio, 40 fathoms.



*Xystreurus brasiliensis*, sp. n.

D. 83. A. 66. Scales 85. Depth  $2\frac{1}{3}$  in length. Eye 3 in head.

Total length 170 mm.

Cape Frio, 40 fathoms.

III.—*A Synopsis of the Fishes of the Family Macrorhamphosidæ.* By C. TATE REGAN, M.A.

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*Synopsis of the Genera and Species.*

I. First dorsal spine quite short.

A. On each side of the back two series of bony plates, in each series 3 well-developed and a fourth, much smaller than the others.

1. Dorsal fins separated by an interspace, or connected by a series of short isolated spines; distance from base of dorsal spine to vent not or but little more than  $\frac{1}{2}$  that from head to caudal fin. (*Macrorhamphosus*.)

a. Diameter of eye not less than postorbital length of head.

Depth of body  $3\frac{1}{2}$  to  $4\frac{1}{4}$  in length; dorsal spine inserted above origin or anterior part of anal, strong, serrated,  $\frac{3}{8}$  to  $\frac{2}{3}$  of distance from operculum to caudal. . . . . *scolopax*.

Depth of body 3 to  $3\frac{1}{2}$  in length; dorsal spine inserted above vent, strong, serrated,  $\frac{1}{2}$  to  $\frac{4}{5}$  of distance from operculum to caudal. . . . . *elevatus*.

Depth of body 4 to  $4\frac{1}{4}$  in length; dorsal spine inserted a little in advance of vent, strong, serrated, when laid back reaching caudal fin. . . . *sagifue*.

Depth of body  $4\frac{1}{2}$  to  $6\frac{1}{2}$  in length; dorsal spine inserted in advance of vent, serrated or not,  $\frac{1}{4}$  to  $\frac{2}{3}$  distance from head to caudal fin, when laid back nearly or quite reaching origin, or sometimes posterior end of soft dorsal. . . . . *gracilis*.

Depth of body  $4\frac{1}{2}$  to 5 in length; dorsal spine inserted in advance of vent, smooth or feebly serrated,  $\frac{1}{11}$  to  $\frac{2}{3}$  of distance from operculum to caudal fin, when laid back not reaching soft dorsal. . . . . *japonicus*.

b. Diameter of eye less than postorbital length of head.  
*velitaris*.

2. Dorsal fins continuous at base; spinous dorsal of 7 spines, the last 5 nearly equidistant and gradually decreasing in length backwards; adults with a patch of bristles on nape. (*Noto-pogon*.)

a. Distance from base of dorsal spine to vent  $\frac{2}{3}$  to  $\frac{4}{5}$  that from head to caudal fin ..... *lilliei*.

b. Distance from base of dorsal spine to vent about equal to that from head to caudal fin.

$\alpha$ . Origin of soft dorsal nearer to base of second dorsal spine than to edge of back in front of spinous dorsal.  
*schoteli*.

$\beta$ . Origin of soft dorsal nearer to edge of back in front of spinous dorsal than to base of second dorsal spine.

Dorsal spine stout, with numerous serrations, inserted above base of soft dorsal ..... *fernandezianus*.

Dorsal spine rather slender, with few serrations, inserted above caudal peduncle ..... *xenosoma*.

B. On each side of the back two series of bony plates, each series with 4 well-developed plates; dorsal fins continuous at base, the spinous dorsal with 7 spines. (*Centrisco*ps.)

1. Second dorsal spine inserted above vent or origin of anal; base of spinous dorsal nearly horizontal.... *sinuosus*.

2. Second dorsal spine inserted above anal fin; base of spinous dorsal nearly vertical.

Dorsal spine  $\frac{1}{2}$  distance from head to caudal; diameter of eye not greater than depth of cheek, scarcely more than  $\frac{1}{4}$  length of snout (in a specimen of 135 mm.) ..... *humerosus*.

Dorsal spine  $\frac{1}{3}$  distance from head to caudal; diameter of eye twice depth of cheek, more than  $\frac{1}{3}$  length of snout (in an adult specimen). *obliquus*.

II. First dorsal spine  $\frac{2}{3}$  as long as second, which is as long as head, distance from head to caudal fin, or depth of body. (*Scolopacichthys*.) ..... *armatus*.

# 1. MACRORHAMPHOSUS, Lacep., 1803.

Hist. Nat. Poiss. v. p. 136.

*Centriscus* (non Linn.), Cuv. Règne Anim. ii. p. 350 (1817).

*Macragnathus*, Gronow, Cat. Fish. p. 147 (1854).

*Orthichthys*, Gill, Proc. Acad. Philad. 1862, p. 234.

## 1. *Macrorhamphosus scolopax*, Linn.

*Centriscus scolopax*, Günth. Cat. Fish. iii. p. 519 (1861).

North Atlantic and Mediterranean.

Specimens in the British Museum from England, Madeira, Spain, and Italy.

2. *Macrorhamphosus elevatus*, Waite.

*Macrorhamphosus scolopax*, var. *elevatus*, Waite, Mem. Austral. Mus. iv. 1899, p. 59, pl. vii. fig. 1.

*Macrorhamphosus gallinago*, Ogilby, Proc. R. Soc. Queensland, xxi. 1908, p. 6.

? *Macrorhamphosus lancifer*, Ogilby, Proc. R. Soc. Queensland, xxiii. 1910, p. 90.

? *Macrorhamphosus robustus*, Ogilby, t. c. p. 91.

*Macrorhamphosus scolopax*, Waite, Rec. Canterbury Mus. i. 1911, p. 171.

*Macrorhamphosus elevatus*, McCulloch, 'Endeavour' Fishes, p. 23, fig. 8 (1911).

Australia and New Zealand.

In the British Museum a single specimen from Tasmania, not quite so deep and with the dorsal spine shorter than the example figured by Waite, but evidently of the same species.

Ogilby has described three species from Queensland, but these are distinguished from each other and from *M. elevatus* by differences in the depth of the body and the length of the dorsal spine, which may not be outside the limits of variation for this species.

3. *Macrorhamphosus sagifue*, Jord. & Starks.

*Macrorhamphosus sagifue*, Jord. & Starks, Proc. U.S. Nat. Mus. xxvi. 1902, p. 69, fig. 2.

Japan.

4. *Macrorhamphosus gracilis*, Lowe.

*Centriscus gracilis*, Lowe, Proc. Zool. Soc. 1839, p. 86; Günth. Cat. Fish. iii. p. 521 (part.).

In the British Museum several examples from Madeira; a very small specimen taken between Montevideo and Magellan may also belong to this species, which is very variable. The ventral scutes are much less distinctly keeled than in *M. scolopax* and the snout is shorter than in that species, only twice as long as the rest of the head in the adult fish.

5. *Macrorhamphosus japonicus*, Günth.

*Centriscus japonicus*, Günth. Cat. Fish. iii. p. 522 (1861).

? *Macrorhamphosus gracilis*, Waite, Mem. Austral. Mus. iv. 1899, pl. vii. fig. 2.

In the British Museum two examples, types of the species, said to be from Japan. These measure 110 and 125 mm. in total length and seem to be specifically identical with the New South Wales specimen figured by Waite.

6. *Macrorhamphosus velitaris*, Pall.

*Centriscus velitaris*, Pall. Spicil. Zool. viii. p. 36, pl. iv. fig. 8; Günth. Cat. Fish. iii. p. 524 (1861).

*Centriscus gracilis* (part.), Günth. Cat. Fish. iii. p. 521 (1861).

*Centriscus brevispinis*, Kner & Steind. Sitzungsber. Akad. Wien, liv. 1866, p. 374, pl. iii. fig. 9.

*Macrorhamphosus hawaiiensis*, Gilb. Bull. U.S. Fish. Comm. f. 1903, p. 613, fig. 237 (1905).

Atlantic and Indo-Pacific.

I have examined small specimens, similar to those described by Pallas, Kner and Steindachner, and Gilbert, from East Africa, the Indian Ocean, China, and the Mediterranean; the last-named do not appear to differ in any respect from the others. There are also some larger examples, up to 85 mm., from Messina, Madeira, and Sierra Leone. The species is close to *M. gracilis*, but has a smaller eye.

## 2. NOTOPOGON, Regan, 1913.

*Supra*, p. 14.

1. *Notopogon lilliei*, Regan.

*Supra*, p. 14.

*Centriscops humerosus*, McCulloch, 'Endeavour' Fish. p. 24, fig. 5, and pl. ix. (1911).

Southern Australia; New Zealand.

2. *Notopogon schoteli*, M. Weber.

*Macrorhamphosus schoteli*, Weber, Tijdschr. Nederl. Dierk. Verein. (2) xi. 1910, p. 77, pl. iv.

W. Atlantic, between Bahia and Montevideo.

3. *Notopogon fernandezianus*, Delfin.

*Centriscus fernandezianus*, Delfin, Rev. Chilen. iii. 1899, p. 76.

Juan Fernandez.

4. *Notopogon xenosoma*, Regan.

*Supra*, p. 14.

Cape North, New Zealand.

## 3. CENTRISCOPS, Gill, 1862.

Proc. Acad. Philad. p. 234.

*Limiculina*, Fowler, Proc. Acad. Philad. lix. 1907, p. 425.

1. *Centriscoops sinuosus*, sp. n.

Depth of body equal to length of head,  $2\frac{1}{4}$  in length of fish. Diameter of eye equal to interorbital width, less than postorbital length of head or depth of cheek, nearly  $\frac{1}{4}$  length of snout. Interorbital region strongly convex, with median ridge. Upper profile sinuous, convex in front of eye and behind head; belly convex. Each dorso-lateral series with 4 large plates. Dorsal VII, 15, the two fins subcontinuous second spine strong, serrated, nearly  $\frac{1}{2}$  as long as distance from operculum to caudal, inserted above vent or origin of anal. Anal 17-18. Pectoral as long as head without snout. Caudal truncate. Brownish above, golden below.

Two specimens, 125 and 135 mm. in total length, from New Zealand, presented by the late Captain Hutton; a smaller example (55 mm.) is more slender, the depth being  $\frac{1}{3}$  of the length.

This species is very near *C. humerosus*, which has a somewhat longer snout and the dorsal spine placed higher and further back. In the type of *C. humerosus* the distance from the centre of the last bony plate of the upper series to the base of the dorsal spine is more than  $\frac{2}{7}$  of that from head to caudal fin, but in *C. sinuosus* only  $\frac{1}{5}$  to  $\frac{2}{9}$ .

2. *Centriscoops humerosus*, Richards.

*Centriscoops humerosus*, Richards, 'Erebus' and 'Terror' Fish. p. 56, pl. xxxiv. figs. 5, 6 (1846); Günth. Cat. Fish. iii. p. 522 (1861).

Southern Australia.

In the British Museum only the type, a dried specimen about 130 mm. long.

3. *Centriscoops obliquus*, Waite.

*Centriscoops humerosus obliquus*, Waite, Rec. Canterbury Mus. i. 1911, p. 170, pl. xxvi.

New Zealand.

4. *Scolopacichthys*, gen. nov.

*Scolopacichthys armatus*, Sauvage.

*Centriscoops armatus*, Sauvage, Arch. Zool. Expér. viii. 1879, p. 36.

Island of St. Paul.

Evidently generically distinct from *Macrorhamphosus*.

IV.—*Brief Descriptions of new Thysanoptera*.—II. By  
 RICHARD S. BAGNALL, F.L.S., F.E.S. (Hope Department of Zoology, University Museum, Oxford).

Suborder TEREBRANTIA.

Family Thripidæ.

*Scirtothrips signipennis*, sp. n.

♀.—Length 1·2 mm.

Light lemon-yellow, first antennal joint almost white, 5 distally very lightly tinged with grey, 6 with distal two-thirds (or thereabouts) and 7 and 8 wholly grey-brown. Fore-wings grey-brown, second and apical fifths white or light grey; hind-wings with middle brown, corresponding to the long dark patch of upper wing.

Head transverse, about 0·8 as long as broad. Eyes rather large and coarsely faceted, pigment very deep purplish black; ocelli with crimson crescentic margins. Antennæ twice as long as the head, slender; relative lengths of joints approximately:—16 : 22 : 32 : 30 : 32 : 32 : 7 : 13—1 and 2 much broader than any of the following, and 6 not divided. Double trichomes on 3 and 4 long and very slender. Mouth-cone short, brown at tip; maxillary palpi 3-jointed, joints 2 and 3 practically subequal in length.

Prothorax about as long as head and about 1·6 times as broad as long, surface sparsely and irregularly set with very minute setæ; one postero-marginal spine near each hind-angle, short, only 0·25 the length of prothorax. Legs somewhat stout, hind-tibia with a series of moderately fine spines on distal half within, and tarsus with a series of similar spines near apex. Pterothorax nearly 1·45 times as broad as the prothorax, and about as long as broad. Wings slender, reaching only to the sixth abdominal segment; cilia fuscous, those of hind margins very long; fore-wing with three minute, widely spaced setæ on distal half of upper vein, and lower vein with but four setæ. Hind-wing with median vein continued almost to apex, very prominent through dark area.

Abdomen elongate-ovate, dorsal surface finely and wavyly striate, in parts reticulate; segments 9 and 10 with moderately long and rather fine bristles, 9 being furnished with a shorter dorsal pair which are somewhat widely separated.

This species somewhat closely resembles *Euthrips cingulatus*, Karny, from which it is easily separated by the prothoracic bristle at each hind-angle, the uniform light yellow colour of body, and the coloration of the antennæ. The coloration of the wings is about the same. The relative lengths of the antennal joints are also distinctive.

*Type*. In British Museum of Natural History.

*Hab*. CEYLON: Peradeniya, 1 ♀ taken by Mr. A. Rutherford from under leaf-sheaths of banana, 16. 6. 13 (Entomological Research Committee).

*Pseudothrips glaucus*, sp. n.

♀.—Length 0.95, breadth of mesothorax 0.28 mm.

General colour light grey-brown, apex of abdomen slightly darker; legs somewhat lighter than the body. Antennæ darker grey-brown, with joints 1 and 3 a little lighter. Wings greyish yellow.

Head transverse, about 0.65 as long as broad, practically as long as prothorax. Mouth-cone almost reaching across prosternum; palpi rather long. Antennæ more than twice as long as head; joint 3 pedicellate, 6 simple, not divided. Relative lengths of joints approximately:—10 : 22 : 27 : 24 : 22 : 26 : 5 : 8.

Prothorax 1.85 times as broad as long, one long and stout bristle near each hind-angle. Pterothorax large. Legs moderately long and stout. Wings long, reaching almost to tip of abdomen; upper vein of fore-wing with an unbroken series of 15–18, and lower vein with 13–15 setæ.

Abdomen elongate-ovate, posterior margin of eighth tergite fringed. Bristles at hind-margin of ninth tergite long, but those of tenth comparatively short, excepting a pair of long dorsal bristles.

This species is easily separated from *P. inequalis* (Beach) by its colour, the undivided sixth antennal joint (and relative lengths of joints), shorter prothorax, and presence of dorsal bristles on tenth abdominal segment.

*Type*. In Hope Collections, University Museum, Oxford.

*Hab*. Cape Town, 1 ♀ from *Sebæa* (Dr. R. Marloth).

*Physothrips antennatus*, sp. n.

♀.—Length 1.3 to 1.4 mm.

Colour dark brown, crimson hypodermal pigmentation

especially noticeable in thorax. Fore-femora basally and all tibiae distally shaded to pale yellowish-white, all tarsi yellow. Basal half of third antennal joint light yellowish-brown and distal half (the constricted part) of both 3 and 4 lighter than the basal half. Wings grey-brown.

Head 0·8 as long as broad across eyes, and nearly as long as the prothorax; cheeks gently diverging to base. Antennae 2·7 times as long as the head; relative lengths of joints 3–8 approximately:—38 : 56 : 30 : 40 : 7 : 13. Joint 4 curiously constricted and produced in the form of a stem distally.

Fore-wing with a series of 10 spines in upper vein, commencing at the basal fourth and extending to the distal third, and 2 at apex; lower vein with a series of 13, commencing just beyond the first bristle in the long series of upper vein.

Abdomen elongate, ninth segment with a pair of dorsal bristles in addition to the postero-marginal series.

This species comes near to *sjostedti* (Tryb.), *usitatus*, Bagn., and *variabilis*, Bagn., but is readily separated from these and all other described species of the genus by the long fourth antennal joint and its curious distal stem.

*Type*. In British Museum of Natural History.

*Hab*. Uganda (*C. C. Gowdey*). Mr. Gowdey writes that this species feeds on the spores of the coffee-fungus, *Hemeleia vastatrix*.

### *Thrips hololeucus*, sp. n.

♀.—Length 1·0–1·2, breadth of mesothorax 0·27 mm.

Colour to the unaided eye white, under a moderate power from very light greyish-yellow to a deeper shade in dark specimens. Antennae with the first joint white or colourless, 2–7 light greyish-brown, basal halves of 3 and 4 lighter, and 5 also lighter basally.

Head transverse, 1·37 times as broad as long, and not quite as long as the prothorax; posterior fourth faintly and irregularly transversely striate. Cheeks gently arcuate; mouth-cone pointed, reaching across prosternum, maxillary palpi long and slender, third joint the longest. Eyes occupying one-half the length of the head, coarsely faceted, pilose; pigmentation deep black. Ocelli with yellowish crescentic hypodermal pigmentation, a short curved seta on each side of the anterior one. A series of short dorsal setae on an irregular line drawn behind the eyes. Antennae with basal joints subapproximate, 2·25 times as long as the head; third



joint pedicellate; relative lengths of joints as follows:—8 : 13 : 17 : 16 : 13 : 17 : 5—2 distinctly broader than any of the following, 5 and 6 somewhat broadly united; double trichomes on 3 and 4 slender and only moderately long.

Prothorax 1·5 times as broad as long, surface faintly and irregularly striate; the two bristles at each posterior angle from 0·3 to 0·34 as long as the prothorax, stout; a series of short postero-marginal setæ, of which the inmost pair is slightly the longest. Dorsal surface irregularly set with setæ. Pterothorax about as long as broad. All legs fairly long and stout, sparingly setose, setæ on the fore-margins of all tibiæ forwardly curved; hind tibiæ with series of short spines on distal third within. Wings reaching to ninth abdominal segment, faintly tinged greyish-yellow; cilia and spines dark. Costa and veins of fore-wing distinct; upper vein with a series of 4–5 basal setæ, 3 terminating at juncture with lower vein, then 4 widely and somewhat regularly spaced ones occupying the distal half; costa with 28 setæ, increasing in length distally, those towards the apex being as long or longer than the breadth of the wing; lower vein regularly set with 15–16 setæ. Cilia on fore-margins of both pairs somewhat sparse and widely spaced; on hind margin close, long, and wavy.

Abdomen elongate-ovate, about twice (or a little more) as long as broad; segments 2 and 3 the broadest, gently narrowing from 3 to 7 and thence more sharply to tip. Eighth tergite with a very fine fringe. Terminal bristles on 9 and 10 long and stout, about 1·5 times as long as the respective segments bearing them, and 9 with a pair of shorter dorsal bristles. Lateral abdominal bristles moderately long and stout, all light greyish-brown.

A distinctive species.

*Type.* In Hope Collections, University Museum, Oxford.

*Hab.* JAPAN: Kobe, July 1913 (*J. E. A. Lewis*).

*Thrips albipes*, sp. n.

♀.—Length 0·9 to 1·1, breadth of mesothorax 0·24 mm.

Head yellowish-white, with greyish-brown cheeks; prothorax golden-yellow; pterothorax also golden-yellow, but deeper and usually shaded with brown. Abdomen rich brown, first (and sometimes the second) segment lighter; all setæ dark. All legs yellowish-white or light lemon-yellow. Antennæ with first segment grey, 3 and sometimes extreme

base of 4 light lemon-yellow; 2 and 4 to 7 brown, 2 sometimes lighter distally. Fore-wings smoky-brown, basal fourth light.

Head almost as in *hololeucus*, about 1.25 times as broad as long, and about as long as the prothorax. Eyes as in *hololeucus*, pigmentation deep purplish-black; ocelli with crimson crescentic pigmentation. Mouth-cone not quite reaching across prosternum; maxillary palpi long, with middle joint the shortest; labial palpi long and slender. Antennæ about 2.3 times as long as the head; relative lengths of joints approximately:—7 : 12 : 17 : 16 : 12 : 17 : 5—2 broader than any of the following, 3 pedicellate, and 5 and 6 rather broadly jointed.

Prothorax 1.5 times as long as broad, with setæ as in *hololeucus*, dorsal surface not striated. Pterothorax about as broad as long. Legs as in *hololeucus*, hind-tibiæ shorter, with a series of short setæ on the distal half within. Wings reaching to the ninth abdominal segment, fore-wings about 15 times as long as broad across middle. Veins of fore-wing not distinct, upper vein with 3 widely-spaced setæ in distal half; lower vein with a series of 14 and costa 26 to 30 setæ. Cilia as in *hololeucus*. Hind-wing with a dark median vein to apex.

Abdomen ovate or, when segments are fully extended, elongate-ovate, apically rather sharply narrowed and pointed. Eighth tergite very finely fringed. Terminal bristles long, ninth segment with a pair of short widely-separated bristles (0.3 to 0.4 the length of the long ones), which are inwardly directed distally. Lateral abdominal bristles somewhat long.

Also a distinctive species.

*Type.* In Hope Collections, University Museum, Oxford.

*Hab.* JAPAN: Okinawa, Luchu Is., on nasturtium, May, and at Kobe, with *T. hololeucus*, sp. n., July 1913 (*J. E. A. Lewis*).

#### Suborder TUBULIFERA.

##### *Docessissophothrips frontalis*, sp. n.

Length about 5.5 mm.

Colour deep blackish-brown; fore-tibiæ light yellowish-brown, all tarsi dark yellowish-brown; wings smoky-brown, cilia darker. Antennæ absent in the unique example.

Head twice as long as broad, almost as in *D. major*, Bagn., but with the vertex produced into a prominent hump, with

the front margin truncate and having the anterior ocellus on the truncate plane facing forwards. The posterior three-fourths is dorsally gently and evenly arcuate, and the surface is irregularly and rather deeply furrowed dorso- and ventro-laterally. Cheeks set with numerous short setæ. Postocular bristles long and colourless; a second shorter and weaker pair set within the longer pair and on about the same line.



*Docessissophothrips frontalis*, sp. n. Head and prothorax viewed laterally, with right front leg.

Prothorax as in *D. major*, bristles at the anterior and posterior angles, together with mid-lateral and postero-marginal pairs, long, slender, and colourless; those on posterior margin the longest. Pterothorax as broad as width across the fore-coxæ and only slightly longer than broad. Wings reaching to the eighth abdominal segment. Fore-femora and tibiæ apparently without the long conspicuous bristles seen in *D. major*; inner margin of fore-tibiæ with numerous rather long setæ (as long as the breadth of the tibia).

Abdomen elongate, gently and roundly narrowed from seventh segment to base of tube. Tube about 0.65 the length of the head, terminal hairs very weak, about 0.7 as long as tube, colourless distally. Bristles on ninth segment about as long as the tube, colourless; other lateral abdominal bristles moderately long, faintly tinged with yellow, or colourless.

*Type.* In Hope Collections, University Museum, Oxford.

*Hab.* JAPAN: one example collected by Mr. John E. A. Lewis.

*Androthrips flavipes*, sp. n.

♂.—Length about 2.3 mm.

Thorax and abdomen dark grey- to blackish-brown, the former a little less deep in colour; head yellowish-brown, with

cheeks dark greyish-brown. All legs (excepting coxæ) yellow. Antennæ with joints 1 and 2 dark brown, the latter lighter apically; 3 and 5 yellow, with very faint tinge of grey distally; 4 yellow, grey-brown near apex; 6 yellow, distinctly tinged with grey distally; and 7 and 8 light grey-brown.

Head approximately 1·2 times longer than broad and 1·5 times as long as the prothorax, sides parallel. Mouth-cone exceptionally short, maxillary palpi with second joint very long. Antennæ 1·55 times as long as the head, joints 3 and 4 much broader than any of the others. Relative lengths of joints approximately:—12 : 18 : 22 : 22 : 19 : 18 : 17 : 12.

Prothorax transverse, about twice as broad as long; bristles at posterior and anterior angles, and the mid-lateral and postero-marginal pairs present. The postero-marginal pair and those at posterior angles long, the latter 0·6 as long as the prothorax. Pterothorax transverse. Fore-femora strongly incrassate, with a stout, blunt, tooth-like projection at the base within, the inner margin straight and set with a few very minute "teeth." Fore-tarsus set with a stout, sharp, curved tooth.

Wings practically clear, rather broad; fore-wings apparently not constricted as in *Hoplothrips*, with 8-11 duplicated cilia.

Abdomen about as broad as the pterothorax, elongate, narrowing evenly from sixth segment to base of tube. Tube 0·6 the length of head, about twice as long as broad at base, and twice as broad at base as at apex. Terminal hairs longer than tube, but very slender (and difficult to see) distally, colourless, except near base. Lateral abdominal bristles long and slender, faintly knobbed; none so long as the tube.

*Type.* In the British Museum of Natural History.

*Hab.* CEYLON: Peradeniya, 1 ♂ taken by Mr. A. Rutherford from *Memecylon umbellatum*, 28. 6. 13 (Entomological Research Committee).

*Gynaikothrips karnyi*\*, sp. n.

Length 1·9, breadth of mesothorax 0·42 mm.

Colour deep blackish-brown, thorax and distal half of tube not quite so dark; all tibiae and tarsi light lemon-yellow, and antennal joints 3-8 lemon- to golden-yellow.

Head about 1·42 times as long as broad and practically

\* Named in honour of Dr. H. Karny, who has done so much work on gall-thrips.

twice as long as the prothorax ; sides parallel. Mouth-cone reaching across prosternum, somewhat pointed. Eyes occupying about one-third the length of the head, finely faceted ; postocular bristles moderately long and stout. Vertex raised in form of a hump. Ocelli large. Antennæ 1·5 times as long as the head ; relative lengths of joints approximately :— 10 : 16 : 23 : 22 : 22 : 21 : 18 : 13—7 and 8 broadly jointed, 8 narrowly pyriform, pointed apically.

Prothorax very short and strongly transverse, at least 2·3 times as broad across posterior angles as long ; all bristles present, long and rather stout, pointed ; postero-marginal pair 0·8 as long as the prothorax. Pterothorax a little wider than width across fore-coxæ and as long as broad. Legs normally stout and long. Wings reaching to eighth abdominal segment, cilia smoky.

Abdomen about as broad as the pterothorax, gently narrowing from fifth segment. Tube 0·6 as long as the head, slightly more than twice as long as broad at base, and twice as broad at base as at apex. Terminal hairs coloured at base and continued as long colourless filaments, about 0·85 as long as the tube. Lateral abdominal bristles yellow, long and rather stout on segments 6–8 at least ; those on 9 particularly long and very slender (and indistinct) apically, up to 1·7 times the length of the tube.

*Type.* In the British Museum of Natural History.

*Hab.* CEYLON : Peradeniya, ex marginal leaf-galls of black pepper (*Piper nigrum*), A. Rutherford, 21. 7. 13 (Entomological Research Committee).

*Ædemothrips* (?) *brevicollis*, sp. n.

♀.—Length 1·9, breadth of mesothorax 0·4 mm.

Colour of abdomen black, first segment brownish ; thorax grey-brown ; head yellow to yellowish-brown, cheeks darker. Antennæ with joints 1 and 2 yellow, 3–5 yellow, lightly shaded with grey, the fifth darker ; 6 chestnut-brown, rather lighter at base, and 7 and 8 dark blackish-brown.

Head only 0·9 as long as broad, and as long as the prothorax, cheeks feebly arcuate, converging towards base. Eyes occupying about 0·34 the length of head. Ocelli small, posterior pair widely separated, almost touching the inside margins of eyes. Postocular bristles about as long as the eye, and interocular pair only about 0·5 as long. Antennæ nearly twice as long as the head ; relative lengths of joints approximately :— 14 : 19 : 23 : 21 : 20 : 19 : 14 : 9. Joint 2 constricted near base, 3 clavate, 4 and 5 roughly

clavate, 6 with apex rather broadly truncate, and 7 and 8 broadly united.

Prothorax about 2·3 times as broad as long; bristles at hind-angles and the postero-marginal pair present, the first-named long, about 0·5 as long as prothorax. Pterothorax transverse, about 1·25 times as broad as long. Legs rather stout and long; each intermediate and hind-femur with a short stout seta on the outer margin beyond middle. Wings absent.

Abdomen elongate-ovate, 0·65 the total length of the insect, broadest at about fifth segment, where it is 1·4 times as broad as the mesothorax.

Tube stout, about 0·8 as long as the head, 1·75 times as long as broad at base and less than 0·5 as broad at apex as at base; terminal hairs short and weak, not quite 0·6 as long as the tube. Lateral abdominal bristles not long, but noticeably strong, especially those on segments 7-9.

*Type.* In Hope Collections, University Museum, Oxford.

*Hab.* JAPAN: Okinawa, Luchu Is., 1 ♀ collected by Mr. J. E. A. Lewis.

*Trichothrips lewisi*, sp. n.

♂.—Length about 1·45, breadth of mesothorax 0·285 mm.

Colour lemon-yellow, antennæ very lightly tinged with grey; first two antennal joints, frons and cheeks, distal half of mesothorax, sides of pterothorax, first abdominal segment, and the anterior corners of segments 2-8 shaded with grey-brown.

Head 1·1 times as long as broad and 1·3 as long as the prothorax. Cheeks constricted behind eyes and near base. Eyes prominent, occupying 0·35 the length of the head, widely separated. Ocelli rather large, posterior ones well apart from inner margins of the eyes. Postocular bristles long and slender; interocular pair rather short. Mouth-cone blunt, broadly rounded at apex, reaching a little more than halfway across prosternum. Antennæ twice as long as the head; relative lengths of joints as follows:—13 : 14 : 20 : 16 : 16 : 16 : 13·5 : 16; apical joint narrowly pyriform.

Prothorax trapezoidal, twice as broad across hind-angles as long, with a distinct median line; mid-lateral, postero-marginal bristles, and pair at hind-angles present, long and slender, the postero-marginal pair the longest. Pterothorax about as long as broad; wings reduced, narrow and vestigial in character, reaching to hind-margin of first abdominal segment. Legs moderately long and stout; fore-femur

incrassate, fore-tibia stout, and tarsus armed with a sharp broad tooth, and also with a hidden curved tooth near apex.

Abdomen only slightly broader than the pterothorax, practically subparallel to seventh segment, and thence gently rounded to base of tube; well-developed wing-retaining bristles on segments 2-6. Tube about 0.6 the length of head, 1.6 times as long as broad near base, and about 0.4 as broad at apex as at base, evenly narrowed from base to tip. Terminal hairs about as long as the tube, slender. Lateral abdominal bristles long and slender on segments 1 to 9, mostly as long as or longer than tube.

A very distinct species of the group characterized by the short mouth-cone, and readily recognized by the form of the head, the relative lengths of the antennal joints, and the distinctive type of coloration. I have pleasure in naming the species in honour of its discoverer.

*Type.* In Hope Collections, University Museum, Oxford.

*Hab.* JAPAN; Okinawa, Luchu Is., 1 ♂, collected by Mr. J. E. A. Lewis, May 1913.

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#### V.—Diagnoses of new Races of African Ungulates.

By ERNST SCHWARZ.

THIS is the third paper dealing with the Ungulates brought home by the Duke of Mecklenburg's second Central-African expedition. In working out the forms now described, the material in the British Museum has been studied, and has been of the utmost value. The thanks of the writer for the facilities afforded are due to Mr. Oldfield Thomas, the Curator of Mammals.

#### *Hippopotamus amphibius tschadensis*, subsp. n.

*Type locality.* Katana, Bornu.

*Type.* ♀ old. Senckenberg Museum, Frankfurt-a.-M. Journal no. 805. Original no. A. 75.

A rather short and broad-faced race, with the orbits strongly projecting and decidedly laid forward.

Orbits strongly projecting; when seen from in front their lateral margin is seen to be placed almost vertically, their upper margin to be much higher than the lambdoid crest. Zygomatic arches slightly narrower than in *H. a. amphibius*,

but distinctly less expanded behind than in *H. a. australis*. Rostrum broad, tubular, not constricted. Lower jaw shorter than in *amphibius*, especially the corpus, whereas the ramus is almost as broad. Cheek-teeth series shorter, as a whole, than in *H. a. amphibius*,  $m_3$  being much larger ( $m_3$  of lower jaw much larger than  $m_2$ ; in *amphibius*  $m_3$  is of about the same size as  $m_2$ ), whereas the anterior cheek-teeth are much smaller. Canines apparently also weaker than in *H. a. amphibius*.

*Dimensions of type skull.* Basal length 600 mm.; occipito-nasal length 563; occipital width 293; zygomatic width 327; postorbital width 300; breadth of rostrum across roots of canines 277; facial constriction in front of for. anteorb. 115; nasals, length 387, posterior breadth 122; length of upper tooth-row (alv.) 243; length of lower  $m_3$  (lower margin of enamel) 73.

The hippopotamus of the Lake Chad region is nearly allied to *H. a. amphibius* of the Nile, in which the orbits are less projecting; from *H. a. australis* of the Cape this race is at once distinguished by the much shorter and broader face and the orbits being laid forwards.

A more detailed account of the local races of *Hippopotamus* will be given in a subsequent paper.

*Bubalis lelwel modestus*, subsp. n.

*Type locality.* Bahr Keeta, N.E. of Ft. Archambault, Upper Shari district.

*Type.* ♂ old. Senckenberg Museum. Journal nos. 355 (skin), 166 (skull). Original no. 141. Collected in February 1911 by Dr. H. Schubotz.

Most nearly related to *B. l. tschadensis*, but smaller and darker.

Colour of mantle dull reddish brown ("bistre," Rép. de Coul.), dark on posterior back (323.3), paler anteriorly (323.2) and on flanks (323.1); underparts, thighs, and shoulders pale ochraceous buff ("buff," 309.1). Top of head and back of ears deep reddish brown like posterior back, face much lighter; chin with a sharply defined brownish-black spot. As in *B. l. tschadensis*, a narrow seal-brown band round hoofs continuous with a large spot above hoof, and a stripe to the wrists and hocks of the same colour. Tail-crest and tip black, base light ochraceous buff.

*Skull.* Much as in *B. l. tschadensis*, except its much inferior size. Horns much smaller than in *tschadensis*; tips slightly curved, but much less so than in *tschadensis*, slightly diverging



in the type, but parallel or even converging in other specimens. Pedicle of horn short, less erected than in *tschadensis*; angle formed by pedicle and middle portion smaller than in *tschadensis*, but distinctly less than in the Nile forms, *B. l. lehwel* and *B. l. roosevelti*.

*Dimensions of type skull.* Basal length 377 mm.; greatest length 477; palatal length 215; zygomatic width 126; postorbital width 129; occipital width 120; length of nasals 213; length of upper tooth-row (alv.) 94.6; distance from first premolar to gnathion 137; horns, length along curve 443, greatest width 210.

Although nearer to *B. l. tschadensis*, this new race is somewhat intermediate between the Chad form and the races of the eastern Sudan. It is, however, less red than either of the latter, and has more erect horn-pedicles, which still more approach the type found in *B. l. tschadensis*, from which it is easily distinguished by its smaller size and darker, more reddish colour.

*Bubalis major invadens*, subsp. n.

*Type locality.* Garua, Benue River, Adamaua.

*Type.* ♂ old. Senckenberg Museum. Journal no. 408 (skull).

*Skull.* Forehead slightly convex, but not so much bent upwards as in *B. m. major*. Jugal generally broad, but its anterior margin not square as in *B. m. major* and *B. m. matschiei*, and gradually passing into the masseteric crest of the maxilla.

*Horns.* Rather wide and strongly laid backwards. Angle formed by tips and middle portion very large; middle portion short, almost not twisted, generally straight and scarcely converging. Tips long, thick, parallel or slightly divergent.

This race has much stronger horns than *B. m. major*, the middle portion of which is less twisted; the skull differs conspicuously in the configuration of the forehead and jugal. A large series of skulls from Ibi and Zungeru, N. Nigeria, have been examined in the British Museum, a more detailed account of which will be published later.

*Dimensions of type skull.* Basal length 419 mm.; greatest length 521; palatal length 252; zygomatic width 133; postorbital width 142; occipital width 138; length of nasals 235; length of upper tooth-row (alv.) 108; distance from first premolar to gnathion 152; horns, length along curve 475 (tips worn), greatest width 310, distance of tips 228.

*Bubalis major matschiei*, subsp. n.

*Type locality.* District of Kpandu, W. Togo.

*Type.* ♂ adult. Senckenberg Museum. Journal no. 398 (skull).

*Skull.* Forehead flat, not convex and not bent upwards. Jugal broad, square in front and sharply set off from the insignificant masseteric crest of maxillary.

*Horns.* Very large and expanded. Angle formed by tips and middle portion usually smaller than in *invadens*; middle portion short, strongly twisted, and very regularly converging. Tips extremely divergent.

The skull of *B. m. matschiei* is easily distinguished by its flat forehead and its large and expanded horns.

*Dimensions of type skull.* Greatest length 501 mm.; palatal length 234; postorbital width 141.5; length of nasals 225; length of upper tooth-row (alv.) 90.5; distance from first premolar to gnathion 143; horns, length along curve 526, greatest width 338, distance of tips 335.

*Damaliscus koba tyra*, subsp. n.

*Type locality.* Ndioko, Gribingi River, Upper Shari district.

*Type.* ♂ ad. Senckenberg Museum, Frankfurt-a.-M. Journal no. 210. Original no. 161. Collected in February 1911 by Dr. H. Schubotz.

Allied to *D. k. korrigum* of Lake Chad and the Lower Shari, but distinguished by the horns being much thinner and their tips being strongly curved upwards and inwards.

Skull very much as in *D. k. korrigum*, but more slender and distinctly narrower across orbital region.

Horns much thinner than in *korrigum* and *tiang*. When viewed in profile they are seen to be much more strongly recurved, the tips being directed upwards from the third knot (counted from the tip). Inward curvature of tips much stronger than in *D. k. korrigum*.

*Dimensions of type skull.* Basal length 378 mm.; palatal length 229; zygomatic width 131; postorbital width 146; length of nasals 171; length of upper tooth-row (alv.) 92.4; horns, length (along curvature) 568, greatest width 300, distance of tips 197, diameter of horn at base 66.5.

This exceedingly well-marked race is at once distinguished from *D. k. tiang*, which has a similar narrow skull, by the strong curvature of the horn-tips. It is much to be regretted that no skins are available for comparison.

"*Damaliscus korrigum jonesi*," Lydekker, is a strict synonym of *D. koba tiang*, as will be shown in a subsequent paper, when the validity of *Damaliscus koba* will also be discussed.

*Cephalophus dorsalis orientalis*, subsp. n.

*Type locality.* Koloka, near Angu, Welle River.

*Type.* ♀ adult. Senckenberg Museum, Frankfurt-a.-M. Journal no. 1195. Original no. 245. Collected by Dr. H. Schubotz in June 1911.

Externally not distinguishable from the other forms of *C. dorsalis*. Skull much larger than in any of them. Rostrum and nasals very long. Floor of orbit not so flat as in the western forms, and orbital portion of jugal scarcely expanded.

A female skull and head-skin from Bambili, Welle River, in the British Museum (no. 7. 7. 8. 224), brought home by the Alexander-Gosling Expedition, shows the same characters, and may be regarded as paratype.

*Dimensions of type skull.* Basal length 178 mm.; upper length 203; zygomatic width 86.4; greatest orbital width 87.8; length of nasals 82.9; orbit to gnathion 104.5; length of upper tooth-row (alv.) 58.9.

There is a gradual increase in size and facial length in the local races of *C. dorsalis*. The West-Coast forms like *C. d. dorsalis* are small and have a short rostrum, the length from orbit to gnathion being generally less than the zygomatic width; in *C. d. castaneus* from South Nigeria and the Western Cameroons the length of the rostrum is already greater than the zygomatic width; in the races of the Congo forest, as typified by *orientalis*, the skull has the normal shape of a *Cephalophus*, the relation between facial length and zygomatic width being not at all so unusual as it is in the short-headed typical form.

*Cephalophus caerulus\* schultzei*, subsp. n.

*Type locality.* Yukaduma, north of River Bumba, South Cameroons.

*Type.* ♀ ad. Senckenberg Museum, Frankfurt-a.-M. Journal nos. 442 (skin), 455 (skull). Original no. 3087. Collected by Dr. A. Schultze in March 1911.

Distinguished from *C. c. bakeri*, Rothschild et Neuville,

\* This specific name replaces *monticola*, which, as will be shown in a subsequent paper, is a clear synonym of *Ourebia ourebi*.

by its whiter underside, more brownish back, and paler thighs.

Colour of "mantle" dark chocolate-brown (warm sepia, 305 Rép.), lighter (no. 3) anteriorly, darker on the rump and the pygal region (no. 4), margined behind by a pale brownish band, and markedly contrasted with the pale colour of the thighs and flanks. Colour of thighs much paler and less brownish than in the eastern forms, much greyer than "otter-brown" (354.2), perhaps with a slight tinge of "smoke-grey" (363.4). Outside of legs "smoke-grey" (no. 4) outside, pale brownish inside. Underside of body much lighter than in the eastern forms, nearly white in some specimens, with a slight tinge of "smoke-grey" (no. 1) in others.

*Dimensions of type skull.* Occipito-nasal length 116 mm.; zygomatic width 55.6; orbital width, greatest 54.6, post-orbital 52.6; nasals, length 43.6, greatest breadth 20.5; length of upper tooth-row (alv.) 36.7.

*Cephalophus caerulus melanorrhæus*, Gray, of Fernando Po, with which this form has been generally united, is a much smaller and duller-coloured animal. From the races of the "Blue Duiker" from the eastern parts of the African forest *C. c. schultzei* differs much less than from this island form. It must be rather distinct from Lönnberg's *C. c. conigicus* from the Lower Congo, which is described as having rufous legs, like the southern races and *C. c. anchietæ* from Angola.

*Sylvicapra grimmia pallidior*, subsp. n.

*Type locality.* Mani, Lower Shari River.

*Type.* ♀, subadult. Senckenberg Museum, Frankfurt-a.-M. Journal nos. 1038 (skin), 704 (skull). Original no. R. 37. Collected February 19th, 1911.

Distinguished from *S. g. abyssinica*, Thos., by its slightly larger size and much paler colour. Coat rather short.

Dorsal surface strongly speckled pale yellow (maize-yellow no. 4, Rép.) and black. Median line generally not markedly darker, but shoulders and flanks much less speckled, so as to appear almost yellow. The pale colour of the shoulders and neck extends to the head, where it deepens to ochraceous buff (buff no. 2, Rép.); cheeks lighter, similar to shoulders. Black facial stripe mostly extending from rhinarium to forehead, but not confluent with the black tuft on vertex. Back of ears blackish grey, margined with pale yellow. Chin white, except two brownish-black patches just below lips. Chest dull buffy, belly white. Tail below white, with a

heavy black stripe above. Thighs much like back, hind legs from hocks very light yellowish (about maize-yellow no. 1, Rép.), and with a black patch and ring just above hoofs. Fore legs similar in colour to hind legs, but less speckled above wrists. The usual black band present only in some specimens, where it sometimes extends almost to below shoulders; in the type-specimen it is entirely absent, only the black patch and ring above hoofs are developed.

*Skull.* Larger than *S. g. abyssinica*, with more projecting orbits and larger bullæ.

*Dimensions of an adult male skull* (no. 637). Greatest length 168 mm.; basal length 142; palatal length 80; zygomatic width 74; postorbital width 72.2; occipital width 49.3; muzzle to orbit 83.5; nasals 53.3 × 32; length of upper tooth-row (alv.) 46; breadth of bulla at anterior margin of auditory meatus 14.6.

This duiker differs from all its allies by its pale colour; from its eastern representatives, *S. g. abyssinicus* and *S. g. roosevelti*, it is also distinguished by its superior size.

*Ourebia ourebi dorcas*, subsp. n.

*Type locality.* Bahr Keeta, N.E. of Ft. Archambault, Upper Shari district.

*Type.* Adult ♂. Senckenberg Museum, Frankfurt-a.-M. Journal nos. 316 (skin), 322 (skull). Collected in February 1911 by Dr. H. Schubotz.

Nearly allied to *O. ourebi montana* from Abyssinia, but distinguished by its smaller size and richer colour.

Upperside dull orange-fawn (hazel no. 4, 'Rép. de Couleurs'), lighter on the sides and neck; thighs decidedly paler (no. 1); the colour of the thighs is continued down the anterior and posterior side of the hind legs, whereas the sides are very pale buffy; fore legs like thighs. Above the hoofs the legs are pale buffy. Forehead and middle portion of face like back, cheeks decidedly paler (hazel no. 1). Above the eyes the usual white streak and on the vertex a distinct dark brown patch, which is less conspicuous in the type-specimen. Back of ears pale fawn, with a large blackish patch; inside of ears with long white hairs. Underside of body yellowish white. Tail above somewhat darker than back; below white at base, deep rusty at tip, and with some black hairs in one specimen.

*Skull.* Much as in *O. o. montana*, but smaller, with narrower brain-case, narrower bullæ, and much deeper hyoidal pits.

*Dimensions of type skull.* Greatest length 171.5 mm.;

basal length 151; palatal length 95.5; zygomatic width 69; postorbital width 72.6; occipital width 46.4; muzzle to orbit 92; length of nasals 57.4; length of interfrontal suture 56.3; length of upper tooth-row 50.8 (alv.).

*Ourebia ourebi splendida*, subsp. n.

*Type locality.* Between Djogto and Lai, east of the Logone River.

*Type.* Old ♂. Senckenberg Museum, Frankfurt-a.-M. Journal no. 969 (skin). Original no. H. 273. Collected in May 1911. (No skull.)

Distinguished at once from *O. ourebi dorcas* by its short coat, brighter colour, and more definite markings.

Colour of upperside bright orange-fawn (buff no. 4, Rép.), distinctly paler on sides and neck (no. 1); thighs much the same colour, sharply set off from that of the back. Hind legs above hocks slightly darker than thighs, below hocks buffy, the sides being much the same colour as the anterior and posterior surfaces. Fore legs like thighs; legs above hoof very pale buffy. Forehead and middle portion of face like back, cheeks buff. Above the eyes the usual white streak, which is more sharply defined than in *O. o. dorcas*. No dark patch on vertex, only some hairs with dark tips. Back of ears pale yellowish fawn, with an indistinct dark patch; inside of ears white. Underside of body pure white, very distinctly set off from the colour of the rump. Tail above darker and richer-coloured than back; below white at base and entirely without black hairs.

*Skull.* Essentially as in *O. o. dorcas*; in the single skull examined the bullæ are somewhat shorter and broader.

*Dimensions of skull (paratype).* Greatest length 166 mm.; basal length 148; palatal length 92; zygomatic width 69.7; postorbital width 76.2; occipital width 46.4; muzzle to orbit 89.5; length of nasals 58.5; length of interfrontal suture 50; length of upper tooth-row (alv.) 46.8.

This oribi is at once distinguished by its short coat, bright colour, and by the absence of a distinct patch on the vertex. With the much smaller *O. ourebi nigricaudata* from Gambia it needs no special comparison, as the latter is more greyish and has a black tail-tip.

*Kobus defassa togoensis*, subsp. n.

*Type locality.* District of Kpandu, W. Togo.

*Type.* ♂ adult. Senckenberg Museum, Frankfurt-a.-M. Journal no. 390 (skull).

A form of the western short-horned *unctuosus*-section of *Kobus defassa* with a massive skull and strongly curved horns.

*Skull.* Very heavy, slightly larger than in *K. d. unctuosus*; facial portion rather short and narrow, premaxillaries not widened at all and square in front. Upper orbital margin not projecting at all, lower rather conspicuously.

Horns short, as in *K. d. unctuosus*, with short tips, which are strongly bent upwards or inwards.

*Dimensions of type skull.* Basal length 362 mm.; upper length 393; palatal length 209; palatal width inside  $m_2$  55·5; postorbital width 157; zygomatic width 147; breadth of rostrum across premaxillæ 56·5; length of upper tooth-row (alv.) 98·9; horns, length along curve 610, greatest diameter at base 71·0.

*Adenota kob riparia*, subsp. n.

*Type locality.* District of Kpandu, W. Togo.

*Type.* ♂ adult. Senckenberg Museum. Journal no. 402 (skull).

A member of the western group of small "kobs," still smaller than *A. kob kob* from Senegambia.

*Skull.* Smallest of any described race, but very broad. Orbit strongly projecting, even more so than in *A. k. nigricans*, in which the postorbital breadth is slightly greater, but the lower margin of the orbit less projecting. Facial portion of skull short and broad; rostrum very short; nasals narrow.

Horns much as in *A. k. kob*, but shorter and rather more curved in their basal and middle portion; distinctly thicker, with shorter tips, which are much more curved forwards.

*Dimensions of type.* Upper length 253 mm.; palatal length 134; palatal width inside  $m^2$  33·5; postorbital width 107; zygomatic width 99; occipital width 83; nasals, length 96·8, greatest breadth 19·3; breadth of rostrum across premaxillæ 32·9; length of rostrum (gnathion to  $p^2$ ) 78·9; length of upper tooth-row (alv.) 65·5; horns, length along curve 345, greatest diameter at base 47·6.

The Togo "kob" is the smallest race of this group known to me. It is at once known by its short broad skull, short rostrum, and strongly projecting orbits.

*A. k. nigricans*, Lydekker, from Sierra Leone, has a much longer rostrum; it was originally described on account of the dark colour of a female in the British Museum, a character which is not at all constant in that race, but seems

to have a similar reason as the dark colour in the Sudan *A. k. leucotis* and *Onotragus maria*, which is a dark form of the Lichi, *Onotragus leché*.

*Gazella rufifrons kanuri*, subsp. n.

*Type locality.* Gulfei, Lower Shari.

*Type.* ♂ ad. Senckenberg Museum. Journal nos. 1037 (skin), 696 (skull). Original no. 12. Collected February 9th, 1911, by O. Röder.

A small race of *G. rufifrons* allied to *G. r. hasleri*, Pocock, from Kano, N. Nigeria, but slightly more brownish.

Colour of mantle near "cinnamon" (323.2, Rép. de Coul.), forehead darker (323.4); flanks slightly darker and duller, thighs distinctly paler than "buff" (309.1); pale facial stripe rather broad; lateral stripe brownish black.

*Skull.* Distinguished by the narrow orbits, long rostrum, and narrow palate. Horns narrow, only expanded at tip.

*Dimensions of type skull.* Basal length 180 mm.; palatal length 199; postorbital width 86; zygomatic width 75.5; nasals  $39.7 \times 23.8$ ; orbit to gnathion 105; length of upper tooth-row 58.0; horns, length on outer curve 269, greatest width 112.

This gazelle is readily distinguished by its pale colour and the shape of its skull and horns. *G. r. hasleri*, from Kano, is more reddish, and *G. r. centralis* is much darker and has much more projecting orbits.

*Gazella rufifrons centralis*, subsp. n.

*Type locality.* Magretta, near Melfi, Bagirmi.

*Type.* ♂ ad. Senckenberg Museum. Journal no. 691. Original no. Sch. 206. Collected April 8th, 1911. (Skull.) A dark form with strongly projecting orbits.

Colour of mantle near "cinnamon" (323.4); forehead not darker; flanks pale "cinnamon" (323.1) and thighs exactly the same colour; lateral stripe deep black.

*Skull.* At once characterized by the very strongly projecting orbits and short narrow muzzle. Palate rather broad.

Horns of medium length, diverging nearly from base and distinctly expanded at tips.

*Dimensions of type skull.* Basal length 185 mm.; palatal length 204; postorbital width 97.3; zygomatic width 82.9; nasals  $54.4 \times 30.0$ ; orbit to gnathion 110; length of upper tooth-row 59.4; horns, length on outer curve 253, greatest width 139.



The dark colour and the shape of the orbits and muzzle serve to distinguish this race from its geographical neighbours. The horns, although already approaching the type of *G. r. albonotata*, Rothschild, from the Sudan, are not quite so much expanded.

*Tragelaphus scriptus pictus*, subsp. n.

*Type locality.* Dugua, Lower Shari River.

*Type.* Adult ♂. Senckenberg Museum, Frankfurt-a.-M. Journal nos. 799 (skin), 827 (skull). Original no. H. 144. Collected February 27th, 1911.

Most nearly allied to *T. s. bor*, Heuglin, from the Bahr-el-Ghazal, but distinguished by its somewhat brighter colour and more distinct markings.

♂. General colour above pale reddish brown (cinnamon no. 2, Rép.), lighter (near cinnamon no. 1) on the sides, blackish brown (warm sepia no. 2) below. Neck very short-haired, buffy (lighter than cinnamon no. 1 and strongly speckled with black), with a sooty patch on withers (warm sepia no. 2). Crown and cheeks light brownish (between cinnamon nos. 1-2). The "Tragelaphine" dark band on forearm and above hock very conspicuous, black on the inside of the legs, slightly mixed with reddish brown outside. The median dark line begins at the muzzle and is interrupted at the forehead; on the neck it is very narrow and very conspicuously mixed with white in the portion of the dorsal crest. Transverse stripes narrow, rather conspicuous; the two longitudinal white stripes present in almost all specimens; in old males they tend to disappear or to dissolve into small spots. White spots on haunches very small. Leg-markings and tail as usual.

*Skull.* Rather large, especially in the facial region: teeth large; bullæ much larger than in any of the eastern forms.

*Dimensions of type skull.* Basal length 215 mm.; upper length 238; palatal length 120; palatal width inside  $m_2$  35; postorbital width 91.4; zygomatic width 91.1; occipital width 68.3; nasals  $86.1 \times 22.0$ ; breadth of rostrum across premaxillæ 35.4; length of upper tooth-row (alv.) 66.6; horns, length along outer curve 264, greatest diameter at base 37.7; length of bulla 38.0.

This race of bushbuck is widely distinct from the Senegal *T. s. scriptus*, in which the males have a considerable amount of dark suffusion, the females a much richer colour and both the white and black markings much more distinct.

*Tragelaphus scriptus signatus*, subsp. n.

*Type locality.* Les M'Brous, River Tomi, near the Gribingi-Ubangi watershed.

*Type.* ♂ adult. Senckenberg Museum, Frankfurt-a.-M. Journal nos. 349 (skin), 162 (skull). Original no. 70. Collected in November 1910 by Dr. H. Schubotz.

Distinguished from *T. s. pictus*, of the Lake Chad district, by its longer fur, deeper colour, and distinctly smaller size.

♂. General colour above deep reddish brown (bistre no. 4, Rép.), paling on the sides (through bistre no. 3 to brownish terracotta no. 1), and brownish black (reddish black no. 2) below. Neck and cheeks paler than back (brownish terracotta no. 2); crown slightly darker (brownish terracotta no. 3). Dark band on forearm deep black inside, but not very conspicuous outside. Median dark line broader than in *pictus*, slightly developed also on forehead, and with comparatively less white in the crest, caused by the crest-hairs being much larger than in the Chad form, but having white tips of the same breadth only. White markings exactly as in *T. s. pictus*; only the white spots on the haunches are less numerous and slightly larger.

♀. Like ♂, except that the neck is more reddish, the black markings reduced, and the underside of the same colour as the flanks.

*Skull.* Smaller than in *T. s. pictus*, with shorter face, narrower rostrum, smaller bullæ, and stouter horns.

*Dimensions of type skull.* Basal length 206 mm.; upper length 234; palatal length 122; palatal width inside  $m_2$  39; postorbital width 95.3; zygomatic width 97.2; occipital width 75.6; nasals  $78.5 \times 21.3$ ; breadth of rostrum across premaxillæ 33.5; length of upper tooth-row (alv.) 58.3; length of horns along outer curve 243, greatest diameter at base 40.5; length of bulla 36.6.

*Tragelaphus scriptus punctatus*, subsp. n.

*Type locality.* Duma, near Libenge, Ubangi River.

*Type.* ♀. Senckenberg Museum, Frankfurt-a.-M. Journal no. 220. Original no. 17. Collected in September 1910 by Dr. H. Schubotz. (No skull.)

Easily distinguished from *T. s. signatus* by its short and close fur, larger spots, and different colour.

♀. General colour above yellowish rusty brown (between bistre nos. 2-3, Rép.), lighter (no. 2) on shoulders, thighs, and legs. Underside of body orange-buff (buff between

nos. 1-2, Rép.). Neck similar but lighter (buff no. 1), and slightly speckled with blackish. No dark patch on withers (♀). Crown and cheeks much like neck, but without the dark suffusion. Median dark line not interrupted at forehead, very narrow, especially on posterior back; spinal crest very scanty, hairs without any white tips. Lower longitudinal white stripe well developed; upper one composed of a row of rather large white spots, which are situated on the white transverse bands and extend almost to the root of the tail. White spots on the haunches comparatively large and very conspicuous. A white spot below eye.

Most probably this form intergrades with *T. s. signatus*.

*Tragelaphus scriptus uellensis*, subsp. n.

*Type locality.* Angu, Welle River.

*Type.* ♂. Senckenberg Museum, Frankfurt-a.-M. Journal no. 1198. Original no. 294. Collected in June 1911 by Dr. H. Schubotz.

♂. General colour above dull rusty brown (tan-colour no. 1), distinctly vermiculated with black, all the hairs having black tips, on sides paler and without the black suffusion. Underside of body brownish black (warm sepia no. 3), separated from the red of the rump by a dull brownish zone (much duller than cinnamon no. 4). Neck very pale, yellowish (maize-yellow no. 4), strongly speckled with black. No distinct sooty patch on the withers. Crown and forehead much darker (buff no. 4) than cheeks (buff no. 1). "Tragelaphine" band on fore leg composed behind of hairs which are distinctly annulated pale yellowish and blackish brown; in front there are only a few blackish hairs. Median dark line on back of nose broad, almost X-shaped, interrupted at forehead. Spinal crest moderately long, strongly mixed with white posteriorly. Longitudinal stripes more normal than in *T. s. punctatus*, the lower one not quite reaching to the haunches, the upper one short and not continued to the transverse stripes. Transverse stripes distinct, regular. White spots on haunches numerous, not quite so large as in *T. s. punctatus*.

This bushbuck has obviously nothing to do with Matschie's *T. s. makalæ* from south of the Ituri River, whose colour is described as "Marron d'Inde." It also differs from the Ubangi form just described in the characters indicated above and also in its colour; the individual hairs are really lighter than in that race, but the black tips give a much duller appearance to the fur. This race would appear to have much

the same relation to *T. s. bor* which *T. s. punctatus* has to the Lake Chad *T. s. pictus*.

*Bubalus caffer hyleus*, subsp. n.

*Type locality.* Molundu, Djah River, S.E. Camaroons.

*Type.* ♂ adult. Senckenberg Museum. Journal no. 79. Original no. 3042. Collected in January 1911 by Dr. A. Schultze. (Skull.)

A dwarfed buffalo, smaller than any known race.

*Skull.* Most like that of *B. c. diehli*, but much smaller; orbital region narrower and orbits less projecting. Facial portion comparatively longer and much narrower, especially muzzle.

*Horns.* Very small. Palm small, flat, almost not thickened at base, directed backwards from base, more so than in *B. c. diehli*, but less than in *B. c. nanus*. Tips much longer than palm, slender, generally in or below level of frontal profile, directed backwards and slightly inwards and downwards at extreme end.

The colour of a female (paratype: Journal, nos. 443 (skin), 434 (skull); original no. 3088) is deep reddish brown ("fawn" no. 308.1) above, richer and clearer on flanks and below ("bistre" 328.4); throat orange-brown; face more or less mixed with black. A distinct black neck-mane present. Fore legs from shoulders, hind legs from below thighs black. Shoulders and outside of thighs mixed with black. Tail slightly paler than back, tip black.

*Dimensions of type skull.* Upper length 378 mm.; palatal length 218; postorbital width 181; width of rostrum across premaxillæ 75.5; length of nasals 136; orbit to gnathion 209; length of upper tooth-row 117; horns, length along outer curve 405, greatest width 350, distance of tips 225, greatest diameter of palm 117.

Apart from its still smaller size, this buffalo is widely different from *B. c. nanus*, whose characters and locality are still doubtful. The horns of the present race are much smaller than those of the type of *nanus*, and show no trace of their curious inward curvature.

*Bubalus caffer adamaue*, subsp. n.

*Type locality.* Garua, Benue River, Adamaua.

*Type.* ♂ adult. Senckenberg Museum. Journal no. 389. (Skull.)

A member of the western section of *B. caffer*, allied to *B. c. planiceros* and *B. c. beddingtoni*.

*Skull.* Much as in *B. c. planiceros*, but somewhat smaller. Orbits moderately projecting; rostrum slender; occiput broad and low.

*Horns.* Distinguished from those of *B. c. planiceros* and *B. c. beddingtoni* by the palm being directed more backwards than in either of them. Palm not depending, almost erected; tips long, stout, strongly bent inwards, more so than in *planiceros* and *beddingtoni*, and backwards at the extreme end, scarcely erected at all. Greatest width of horns very small comparatively.

This well-marked buffalo has nothing to do with *B. c. brachyceros* of Lake Chad, with which it has been identified by Mr. Lydekker in the 'Catalogue of Ungulates.' Specimen 4. 7. 9. 13 of the British Museum belongs to this race. As a matter of fact, under the head of *B. c. brachyceros* a number of various races have been mixed up. On the other hand, specimens referable to *B. c. brachyceros* are treated as different species.

VI.—*Notes on the Apidæ (Hymenoptera) in the Collection of the British Museum, with Descriptions of new Species.*  
By GEOFFREY MEADE-WALDO, M.A.

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III. Subfamily ANTHOPHORINÆ.

The following paper deals solely with the genus *Anthophora*, Latr. Nine new species and two new varieties are described, and some notes on described species added, together with certain points on synonymy.

The types are all in the British Museum.

ANTHOPHORA, Latr.

*Key to the new Species here described.*

1. (2) First recurrent nervure in fore wing  
received at apex of second cubital  
cell, interstitial with second trans-  
verse cubital nervure (subg. *Habropoda*) ..... [(Assam.)  
*rowlandi*, sp. n.
2. (1) First recurrent nervure received at  
middle of second cubital cell.
3. (4) Pubescence of abdomen emerald-green. [(Perak.)  
Length 16 mm. .... *hanitschi*, sp. n.

4. (3) Pubescence of abdomen otherwise coloured.
5. (10) Large species, 15 or 16 mm.
6. (7) Thoracic pubescence dark, pubescence on median segment canary-yellow.. *pseudobomboides*, sp. n. [(Assam.)
7. (6) Thoracic pubescence fulvous.
8. (9) Scopa on hind tibiae and tarsi black and white ..... [(Transvaal.)
9. (8) Scopa on hind tibiae and tarsi black and fulvous ..... *pseudococoncinna*, sp. n. [(Singapore.)
10. (5) Medium to small species, 8-12 mm. *fulvohirta*, sp. n. [(Africa.)
11. (12) Male, 8 mm. .... *torridella*, sp. n.
12. (11) Females.
13. (14) Thoracic pubescence pale, abdomen black, with pale apical fasciae .... [(Africa.)
14. (13) Thoracic pubescence fulvous. *pygmæa*, sp. n.
15. (16) Clypeus black, pale yellow apically; antennae black ..... *oldi*, sp. n. (Africa.)
16. (15) Clypeus yellow, with two subquadrate yellow marks, antennae black, scape and joint 3 ferruginous ..... [(Africa.)
- rhodesiae*, sp. n.

*Anthophora nubica*, Lep., var. *ugandæ*, var. nov.

♀. Nigra; capite, thorace (metathorace excepto), pleuris griseo-villosis, pilis intermixtis nigris; metathorace dense nigro-villoso; abdomine nigro, tergite 4 omnino, 5 lateribus albo-hirsutis; tergite 5 fimbria, mediana, fusca; mandibulis basi et apice testaceis, clypeo linea mediana longitudinali, apice extremo maculaque labro basi pallide flavis; pedibus intermediis ac posticis nigro-hirtis.

Long. 15 mm.

♀. Differs from both typical *A. nubica*, Lep., and var. *somalica*, Magr., in having the pale pubescence on head and thorax much less conspicuous. This pubescence has an almost bluish appearance, due apparently to the admixture of griseous and black hairs. In having tergite 4 covered with pale pubescence and the metathorax clothed with dense black pilosity, this form combines the characters of the typical form and var. *somalica*; the pale markings on the clypeus are much more reduced than in the typical form.

Length 15 mm.

6 ♀ ♀.

UGANDA PROTECTORATE: Buddu, west shores of Victoria Nyanza, 3700 ft., ix. 1911 (type); Budongo Forest, Unyoro, 3400 ft., xii. 1911; Buamba Forest, Semliki Valley, 2300-2800 ft. (*S. A. Neave*).

*Anthophora pseudoconcinna*, sp. n.

♀. Nigra, fulvo-pilosa, pedibus plerumque nigro-pilosis; similis *A. concinna*, sed major, pedibus intermediis posticisque (tibiis iii. supra exceptis) nigro-hirtis; antennis nigris obscure ferrugineis infra; clypeo (duabus maculis subquadratis nigris exceptis) labroque flavis, mandibulis basi flavis, apice ferrugineis; area postoculari, pleuris, abdomine lateribus tibiisque iii. supra albo-pilosis; ano brunneo; alis hyalinis.

Long. 16 mm.

♀. Black; head, thorax, and abdomen almost wholly clothed with fulvous pubescence, that on thorax mixed with black hairs; the space behind the eyes, the jowls, clypeus, labrum, pleura, sternum, abdominal segments 2-5 laterally, anterior legs, and posterior tibiæ above clothed with white pubescence.

Anal fascia chocolate-brown. Mandibles at base, labrum, and a **L**-shaped mark on clypeus pale lemon-yellow. Mandibles apically and tegulæ ferruginous. Wings hyaline.

Length 10 mm.

Numerous ♀ ♀, 3 ♂ ♂.

♂. Similar to the female, differing only sexually, scape yellow beneath.

SOUTH AFRICA: Sterkfontein, Transvaal (*H. P. Thomas-set*) (type ♀). BRITISH EAST AFRICA: Upper Kuia Valley, S. Kavirondo (4200 feet); Makindu, Mito Andei, iii.-iv. 1911 (*S. A. Neave*). UGANDA: Entebbe (*C. C. Gowdey*), Western Ankole (4500-5000 ft.), Banks of Nile, near Kakindu (*S. A. Neave*). BRITISH CENTRAL AFRICA: West Nyasa (*Dr. J. E. S. Old*). ABYSSINIA: Iligo Samula and Busika (*R. J. Stordy*).

This appears to be a species of wide distribution, but of very constant colouring. It has the general facies of *A. concinna*, Klug (= *vestita*, Sm.), and *A. capensis*, Fr., but may be separated at once from these two species in having the intermediate and posterior legs with densely black pubescence, relieved only by a white fringe on the posterior tibiæ; it also resembles *A. africana*, Fr., but that species has both pleura and posterior legs with black pubescence.

*Anthophora pygmæa*, sp. n.

♀. Nigra; clypeo labroque (maculis inconspicuis exceptis) mandibulis basi pallide luteis; tegulis ferrugineis; capite thoraceque

ochraceo-pubescentibus, mesonoto pilis nigris intermixtis, abdomine fasciis apicalibus pallidis, fimbria anali brunnea; segmentis subtus albedo ciliatis, pedibus plerumque griseo-hirtis, tibiis metatarsisque posticis supra albo-, subtus nigro-villosis; alis hyalinis.

Long.  $8\frac{1}{2}$  mm.

♀. Black; clypeus (except for two small black marks near base), an elongate spot above it, labrum and mandibles basally yellow; mandibles at apex and tegulæ ferruginous; head and thorax covered with pale pubescence, that on thorax tinged with ochraceous, and on scutellum and metanotum mixed with black hairs; pubescence behind the eyes, on the jowls and pleura, white; tergites 1-3 with apical fasciæ of pale ochraceous pubescence, tergite 4 with a griseous fascia, anal fimbria chocolate-brown. Front legs with short pale pubescence, the tarsi with black hairs, middle and posterior legs with silvery pubescence, pubescence below black. Wings hyaline.

Length  $8\frac{1}{2}$  mm.

♂. Similar to the female, but with the usual sexual differences, viz., scape beneath, cheeks, clypeus, labrum, and mandibles at base ivory-white.

A long series of both sexes.

NORTH RHODESIA: Lower Luangwa River, ix. 1910 (type); Mid-Luangwa Valley; Luwumbu Valley, Upper Luangwa, 2500-3500 ft.; Alamadzi River, vii.-ix. 1910 (S. A. Neave); 80 miles west of Kamba Gorge, 1900 (O. Silverlock).

This small and sombrely coloured species is strongly reminiscent of the Palearctic *A. bimaculata*, Panz.

*Anthophora torridella*, sp. n.

♂. Nigra; scapo antice, genis, clypeo, labro, mandibularum basi albis; flagello tegulisque ferrugineis; capite, thorace, abdominisque segmentis 1-6 fasciis apicalibus fulvo-hirtis; pedibus extus ochraceo- intus nigro-pubescentibus; alis hyalinis.

Long. 8 mm.

♂. Black; scape beneath, cheeks, clypeus, labrum, and mandibles at base ivory-white; flagellum and tegulæ ferruginous; head and thorax covered with fulvous pubescence, paler on pleura and sternum; tergites 1-6 with fulvous apical fasciæ of pubescence, tergite 1 with long fulvous hair basally as well as apical fasciæ; pygidium acute, striate, fringed with fulvous hair. Legs uniformly clothed on outside with pale ochraceous pubescence, on the inside with



black pubescence. Joint 3 of antennæ short, hardly so long as 4+5. Wings clear hyaline.

Length 8 mm.

15 ♂♂.

NORTHERN RHODESIA: Mid-Luangwa Valley, viii. 1910 (*S. A. Neave*).

Strongly resembles *A. pygmæa*, but has fulvous pubescence.

*Anthophora oldi*, sp. n.

♀. Nigra; clypeo apice, labro mandibulisque basi luteis; tegulis ferrugineis; capite, thorace abdominisque segmentis 1, 2 fulvo-, segmentis 3, 4 et 5 (laterale) pedibusque plerumque griseo-hirtis; segmentis 1-4 apice fasciatis; alis hyalinis.

Long. 12 mm.

Black; the apical margin of clypeus, labrum, and mandibles at base yellow; head (except beneath) and thorax covered with a fulvous pubescence, paler on the face, denser and darker on the thorax (on the mesonotum some black hairs are intermixed), tergites 1 and 2 with a short, sparse, fulvous clothing; the area behind the eyes, the head beneath, mesopleura below densely, tergites 3, 4 wholly, and 5 on the sides sparsely clothed with griseous pubescence; all the tergites have distinct apical fasciæ, that on tergite 1 fulvous, the rest griseous, anal fimbria dark chocolate-brown.

Front legs pale with long hair at base of femora, middle and posterior legs with a mixture of dense silvery-brown hair on tibiæ and tarsi. Tegulæ ferruginous. Wings hyaline.

Length 12 mm.

9 ♀♀.

NYASALAND: Blantyre (*Dr. J. E. S. Old*) (type); Valley of Bukuru River, 3000 ft., vi. 1910 (*S. A. Neave*). CONGO

FREE STATE: Katanga, Kambove, 4-5000 ft. (*S. A. Neave*).

N. RHODESIA: Broken Hill, ii. 1912 (*F. V. Bruce-Miller*).

*Anthophora rhodesiæ*, sp. n.

♀. *A. oldi* affinis, sed clypeo flavo, duabus maculis subquadratis basi, nigris; tibiis iii. metatarsisque nigro-hirtis; capite, thorace supra, abdominis segmentis 1-3 fulvo-, 4-5 griseo-hirtis; ano fusco; labro areaque postoculari infra albo-, mesopleuris pallide flavo-hirtis; pedibus 1 pallide-, 2 et 3 nigro-hirtis; antennis plerumque nigris, scapo, art. 3<sup>tio</sup> tegulisque ferrugineis; alis hyalinis.

Long. 12 mm.

Black, face covered with golden brown and whole of thorax above with a dense orange-red pubescence, paler on pleura. Tergites 1 and 2 with short, dense, orange-red pubescence, tergite 3 with grey and reddish hair intermixed, tergites 4 and 5 densely covered with griseous pubescence, anal fimbria dark chocolate-brown; sternites clothed with a dark ferruginous pubescence, all the segments with an interrupted apical fascia of pale pubescence. Area behind the eyes and the cheeks covered with dense long white hair. Mandibles at base and labrum pale yellow, with a sparse covering of white pubescence; clypeus mostly pale yellow, with two subquadrate marks at base black. Front legs covered with pale pubescence, that on femora long and griseous, on tibiæ and tarsi pale golden; middle and posterior legs mostly covered with dense chocolate-brown hairs, the intermediate tibiæ and posterior knees golden brown. Antennæ for the most part black; scape, joint 3, and tegulæ ferruginous. Wings hyaline.

A long series of ♀ ♀.

Length 12 mm.

N. RHODESIA: Upper Luangwa River, vii.-viii. 1910 (type), Niamadzi River, near Nawalia (2000 ft.), and Chiwera, ix. 1911; Mid-Luangwa Valley (S. A. Neave); Ulunga (F. V. Bruce Miller).

This handsome species comes very near *A. oldi*, but the thoracic pubescence is a much richer orange-red. Other differences are as follows:—

| <i>A. oldi</i> .   | <i>A. rhodesiæ</i> .                                     |
|--|--|
| Clypeus black, pale yellow apically.                     | Clypeus yellow with two subquadrate black marks at base. |
| Antennæ black.   | Antennæ black, scape and joint 3 ferruginous.            |
| Second abscissa of radius distinctly shorter than third. | Second and third abscissæ of radius about equal.         |

*Anthophora (Habropoda) rowlandi*, sp. n.

♀. Nigra; capite, thorace abdomineque pallide fulvo-pilosis; capite prothoraceque pilis nigris intermixtis; tergite secundo nigro-fasciato; antennis labro clypeoque nigris, mandibulis subferrugineis; pedibus fulvo-pilosis; alis hyalinis.

Long. 15 mm.

Black; the head, thorax, and abdomen clothed with a pale fulvous pubescence, that on the head and prothorax intermixed with black hairs; clypeus sparsely clothed with dark

hair; pubescence on abdomen somewhat more reddish towards apex, tergites 2 with a transverse fascia of dark hair. Antennæ, clypeus, and labrum black, the labrum with a covering of golden-brown hairs; mandibles faintly ferruginous. Legs ferruginous, the pubescence golden brown.

Clypeus and mandibles at base finely and evenly punctured, vertex subnitidulous, almost impunctate. Wings hyaline.

Length 15 mm.

♂. Similar to ♀, differing only in having the clypeus totally pale yellow. The scape is black beneath, *not yellow*, as is so prevalent in males of this genus.

4 ♀ ♀, 4 ♂ ♂.

ASSAM: Shillong, viii. 1903 (*R. E. Turner*).

This species, which I have pleasure in naming after its captor, is apparently near to *A. (Habropoda) khasiana*, Cam. (= *fulvipes*, Cam., Ann. & Mag. Nat. Hist. (7) xiii. p. 211, 1904), but may be distinguished from it by the entirely black clypeus, without any keel. Cameron describes his species as having the "face tuberculate in the middle"; there is no such character in *A. rowlandi*.

### *Anthophora fulvohirta*, sp. n.

♀. Nigra; capite, thorace, pleuris, terg. 1-4, pedibus plerumque fulvo-hirtis; area postoculari pilis longis et albidis, vertice pilis nigris testaceisque intermixtis; terg. 5 nigro, fascia apicali metatarsisque iii. (basi excepto) nigro-pilosis; antennis nigris supra, scapo albedo infra, art. 9-12 ferrugineis infra; tegulis ferrugineis; mandibulis (apice excepto), genis clypeoque apice linea longitudinali flavidis; alis subhyalinis, venis nigris.

Long. 15 mm.

♀. Black; head, thorax, pleura, tergites 1-4, and legs for the most part clothed with fulvo-ferruginous hair, that on the vertex intermixed with long black and testaceous hairs and on the jowls with long and white hair; tergite 5 black, with an apical fascia of black hair, metatarsus iii. (except basally) black-haired; tegula ferruginous; mandibles (the apex excepted), cheeks, the clypeus apically, and a narrow longitudinal line at right angles to the apical band yellowish. Wings subhyaline, the nervures black.

Clypeus and labrum rather coarsely and evenly punctured, thorax and abdomen finely; joint 3 of antennæ equal in length to joints 4, 5, and 6.

Length 15 mm.

♂. More slender, otherwise differing only sexually.

3 ♀ ♀, 3 ♂ ♂.

MALAY PENINSULA: Singapore, 2 ♀ ♀, 2 ♂ ♂ (type ♀), and Kukub, S.W. Johore (*H. N. Ridley, F.R.S.*), 1 ♂. BORNEO; Sandakan, 28. vii. 1893, 1 ♀.

*Anthophora hanitschi*, sp. n.

♀. Nigra; capite thoraceque viridi-pubescentibus, pilis nigris intermixtis, abdomine supra splendide viridi-pubescenti, pilis sparsis et fulvis intermixtis; terg. 5 fascia apicali fulvo-pilosa; pedibus plerumque nigro-hirtis, sed coxis trochanteribusque albo-pilosis, tarsis anticis tibiisque posticis supra fulvo-pilosis; area post-orbitali pleurisque pallide pilosis; mandibulis basi duabus maculis, labro, clypeo apice lineaque longitudinali flavis; alis subhyalinis.

Long. 16 mm.

♀. Black; head and thorax clothed with green pubescence, with black hairs intermixed, abdomen above clothed with rich emerald-green pubescence, with fulvous hairs somewhat sparsely intermingled; sternites ferruginous, with sparse apical fasciæ of fulvo-ferruginous hair; tergite 5 with an apical fascia of fulvo-ferruginous hair. Legs for the most part black-haired, but coxæ and trochanters with white pubescence, anterior tarsi and posterior tibiæ above fulvous-haired; the area behind the eyes, the jowls, and pleura clothed with whitish pubescence. Mandibles basally and labrum with two yellow spots, clypeus at apex and a narrow longitudinal line at right angles to apical line yellow. Wings subhyaline. Mandibles and hypopygium impunctate, labrum and clypeus (except the nitidulous yellow longitudinal line) distinctly and evenly punctured; vertex, thorax, and abdomen covered with even fine punctures; joint 3 of antennæ equal to joints 4, 5, 6.

Length 16 mm.

PERAK: Maxwell's Hill, 20th Aug., 1908 (*Dr. R. Hanitsch*).

1 ♀.

This handsome species is dedicated to Dr. Hanitsch, Curator of the Singapore Museum, by whom it was collected and presented. The only other Eastern representative of the genus with similar green pubescence is *A. æruginosa*, Sm., from Australia, which may be immediately distinguished by its smaller size and the absence of fulvous pubescence on the hind tibiæ. Viewed from above the abdominal pubescence has a fulvous tinge; viewed from behind it is emerald-green.

*Anthophora pseudobomboides*, sp. n.

♀. Variegata; antennis, capite, thorace, terg. 1-3 nigris; mandibulis, terg. 4-6, sterno omnino, pedibusque ferrugineis; labro maculaque clypeali triangulari pallide flavis; vertice thoraceque nigro-, segmento mediano ochraceo-, genis pleurisue albo-hirtis; terg. 1, 2 (lateribus exceptis), 4-6 fulvo-, terg. 2 (lateribus) et 3 nigro-pubescentibus; pedibus nigro-hirtis, tibiis posticis apice penicillis ochraceis; alis pallide fuscis.

Long. 15 mm.

♀. A variegated species; the antennæ, head, thorax, and tergites 1-3 black; the mandibles, tergites 4-6, the sternum altogether, and the legs ferruginous. Pubescence as follows:—that on the vertex and thorax black, with a brownish tinge; on the median segment canary-yellow; on the jowls and pleura white; tergites 1, 2 (with exception of sides), and 4-6 fulvous, tergite 2 laterally and 3 black; legs black-haired, the posterior tibiæ apically with ochraceous tufts. Wings faintly fuscous. Mandibles finely punctured, the whole insect otherwise almost impunctate; joint 3 of antennæ about equal to joints 4 and 5.

ASSAM (*W. F. Badgley*), 1 ♀.

A most distinct species, the canary-yellow pubescence on the median segment and the ferruginous and black abdomen giving a very Bombiform appearance to the species.

*Anthophora sicula*, Smith, ♂ (nec ♀).

Two species are represented by the sexes of *A. sicula*, Smith. The name will stand for the male. The specimen labelled and described as *A. sicula*, ♀ (the label, in Smith's handwriting, appears as "*A. sicilia*"), is *A. acervorum*, var. *pennata*, Lep. A ♀ specimen from the Edward Saunders Collection, originally from the Smith Collection, bears Dr. Friese's determination "*A. acervorum*, var." The true *A. sicula* lacks the dilated tuft of hair on the intermediate tarsi and the long ciliæ on the other joints, so conspicuous in males of *A. acervorum*.

*Anthophora (Amegilla) villosula*, Smith.

*Anthophora villosula*, Smith, Catal. Hymen. Brit. Mus. ii. p. 338 (1854). ♂.

*Anthophora florea*, Smith, Descr. New Spec. Hymen. p. 123 (1879). ♀.

*Anthophora pingshiangensis*, Strand, Archiv für Naturg. Abt. A, Heft 3, pp. 105-107 (1913). ♂.

There can be no doubt that *A. florea*, Sm., is the female of

his *A. villosula* described some years previously. Both specimens come from the same locality (Shanghai). A good description of the female of *A. villosula* is given by Friese ('Die Bienen Europas,' iii. p. 95). Male co-types of *A. ping-shiangensis*, Strand, from Pingshiang, S. China, are typical *A. villosula*.

The following three African species, all rather similar in appearance and belonging to the *A. quadrifasciata* group, differ as below :—

- |    |   |  |
|----|---|--|
|    | Head and thorax black, with pale or fulvous pubescence; abdomen with pale apical fasciæ of pubescence.  |  |
| 1. | Tergites 4 and 5 covered with a sparse but distinct white pubescence . . . .  | 2.   |
|    | Tergites 4 and 5 covered with a sparse but distinct black pubescence; posterior tibiæ with a pale scopa. Length 11 mm. . . . .  | [Sm. (Sierra Leone.)<br><i>albigena</i> , Lep., subsp. <i>fallax</i> , |
| 2. | Clypeus coarsely punctured; pubescence on head and thorax above ochraceous mixed with black, that on pleura whitish; tergite 1 with apical fascia pale fulvous; posterior tibiæ with a whitish scopa. Length 15 mm. . . . .                           | <i>rapida</i> , Sm. (Natal.)   |
|    | Clypeus more finely punctured; pubescence on head and thorax rich orange-red, that on pleura paler; tergites 1-8 with apical fasciæ pale fulvous, posterior tibiæ with bright orange-red scopa, and a tuft of white pubescence at apex. Length 13 mm. | <i>torrida</i> , Sm. (Sierra Leone.)                                   |

*A. torrida* may be synonymous with *A. calens*, Lep., from Senegal. The type-specimen agrees very well with Lepeletier's excellent description of *A. calens*. Specimens labelled as "*A. calens*" in Smith's collection are certainly identical with his own *A. torrida*.

### *Anthophora bipartita*, Smith.

*Anthophora bipartita*, Sm., var. *flavicollis*, Gerst.

*Anthophora bipartita*, Sm., var. *nigroclypeata*, Fr.

It seems highly probable that this species and *A. flavicollis*, Gerst., are varieties of the same species; and since Smith's species has priority of publication, *A. flavicollis* must be considered the variety. The difference is exactly similar to that existing between *A. armata*, Fr., and the var. *clitelli*-

gera, Fr., except that in this species it is the *typical* form which has the thorax unicolorous, whereas in *A. bipartita* the var. *flavicollis* is so marked. Again, it would seem that *A. nigroclypeata*, Friese, is no more than another variety, in which the clypeus and labrum are black, with the cephalic pubescence of the same colour. Friese ('Die Bienen Afrikas,' p. 270) notices the near relationship, but had only seen specimens of the two forms from East and West Africa respectively. The two forms, however, overlap in Uganda, the meeting-place of the East and West African fauna. Further, it would seem that the difference between *nigroclypeata* and *flavicollis* applies only to the females, since a large series of males from the following localities show a remarkable similarity:—Sierra Leone (*J. J. Simpson*), S. Nigeria (*W. C. W. Eakin*), N. Nigeria (*J. W. Scott Macfie*), Gold Coast (*H. T. Palmer*), Uganda Protectorate and Brit. East Africa (*S. A. Neave*), Nyasaland (*J. E. S. Old*), and the Transvaal (*H. P. Thomasset*).

*Anthophora acraensis*, F.

Without having seen the type it is very difficult to determine satisfactorily the typical form of this species. There is a large series in the British Museum, from numerous localities in both tropical and subtropical Africa, apparently referable to *A. acraensis*. The specimen described by Fabricius (Ent. Syst. ii. p. 329) was a male. Dours is certainly correct (Monogr. Icon., *Anthophora*, p. 84, 1869) in interpreting the "caput nigricans" referred to by Fabricius as meaning that the hairs of the face and head beneath (*i. e.* behind the eyes) were white, those on the vertex intermingled with black.

"Ano albo," also from the Fabrician diagnosis, is very vague. According to Dours (*l. c.*) segments 6 and 7 are covered with white pubescence mixed with ferruginous; Friese ('Die Bienen Afrikas,' p. 269) considers segment 5 to be clothed with white hair. Probably this is variable, since in var. *albocaudata*, Dours, segment 4 is also white.

*Anthophora advena*, Smith (type in B. M.), has been considered conspecific with *A. acraensis*, F.; but "thorax . . . subtus niger" (Fabricius, *l. c.*) does not agree with Smith's species, in which the sternum is griseous. The fourth and following segments of the abdomen are clothed with white pubescence, as in var. *albocaudata*, Dours, of which it may be the male.

*Anthophora cincta*, F.

The locality (Malabar) given for this species by Fabricius in his original description (Spec. Insect. i. p. 473, 1781) is certainly incorrect, for the species is without doubt Ethiopian, as noticed by Smith (Descr. New Spec. Hymen. p. 124, 1879). Fabricius himself was doubtful at a later date (Syst. Piez. p. 330, 1804), for he queries the locality.

The *Anthophora cincta* described by Dours (Monogr. Icon., *Anthophora*, p. 58) is an Australian species synonymous with *A. cingulata*, F., q. v.

Friese did not know *A. cincta*, F., from Africa, but Vachal records it from several West-African localities.

In the British Museum there is a typical series from the UGANDA PROTECTORATE: west shore of Victoria Nyanza, Buddu (3700 ft.), Sept. 1911 (*S. A. Neave*); Entebbe, May 1912 (*C. C. Gowdey*). SIERRA LEONE: Free Town, Sept. 1899 (*E. E. Austen*). NORTHERN NIGERIA: Dec. 1912 (*J. J. Simpson*).

The following description is taken from the type in the Banks Collection at the British Museum:—

♀. Black; mandibles (except extreme apex), labium, and a thin L-shaped mark on clypeus pale yellow. Head, thorax, and pleura more or less densely clothed with green pubescence, intermixed with a few black hairs; pubescence behind the eyes below whitish. All the tergites with apical metallic-green fasciæ, those on tergites 3-5 widening medially. Legs: anterior pair covered with green pubescence, intermediate tibiæ and tarsi green above, black beneath; posterior legs black, the tibiæ ferruginous above. Antennæ black, flagellum ferruginous beneath.

*Anthophora vivida*, Smith.

Friese ('Die Bienen Afrikas,' p. 264) wrongly gives the first abdominal segment as having a blue fascia; the first segment is entirely black.

*Anthophora modesta*, Smith.

Dalla Torre (Catal. Hymen. x. p. 277) gives this species as American. The type, which is in the British Museum, is from St. Vincent, Cape Verde Islands. There are also specimens with no more explicit data than "West Africa."

It is a most striking insect; black, with an apical fascia of white pubescence on the first tergite, and has the inter-



mediate and posterior legs richly clothed with dense fulvous-red scopa.

Total length 15 mm. ; length of fore wing 11 mm.

*Anthophora albigena*, Lep., subsp. *fallax*, Sm.

*Anthophora fallax*, Sm. New Spec. Hymen. Brit. Mus. p. 120 (1879).  
♂ ♀. (Sierra Leone.)

*Anthophora lucknoviensis*, Rad. Wiadom. z nauk Przyrodz. Warszowa, ii. p. 76 (1882). ♂. (Lucknow.)

Smith's *A. fallax* is evidently a subspecies of the widely spread *A. albigena*, Lep., and specimens from N. Bengal, Bombay, and Ceylon stand in the British Museum series, placed there by Smith himself.

*A. albigena*, subsp. *quadrata*, Ckll., recently described from Nasik, Bombay Presidency (Comber Coll.), is also this subspecies.

*Anthophora albigena*, Lep., var. *pyramidalis*, W. F. Kirby.

The *Podalirius pyramidalis* described by Kirby from Socotra (Bull. Soc. Liverp. Mus. iii. p. 24, 1900) was considered by Kohl to be co-specific with *A. albigena*, Lep., a widely distributed species in the South Palæarctic region ; but at the same time he recognizes that it may be considered a variety, in which case Kirby's name would stand (' Hymenopteren Südarabiens,' p. 4, 1905).

A comparison between co-types of Kirby's insect and specimens of typical *A. albigena* from Algeria shows the following differences:—

*A. albigena*, Lep.—Scape beneath bare ; cheeks white ; hair on posterior tibiæ white.

*A. albigena*, Lep., var. *pyramidalis*, W. F. Kirby.—Scape beneath clothed with short, dense, white pubescence ; cheeks black ; hair on posterior tibiæ fulvous.

*Anthophora himalayensis*, Rad.

*Anthophora himalayensis*, Rad. Wiadom. z nauk. Przyrodz. Warszowa, ii. p. 75 (1882).

*Anthophora proserpina*, Grib. Bull. Soc. Ent. Ital. xxv. p. 286 (1893).

I have compared a specimen of *A. proserpina*, taken by myself at the type-locality (Malacca) in 1908 ; it agrees perfectly with Gribodo's description. The species is certainly synonymous with *A. himalayensis*, Rad., of which the British Museum possesses a good series from Middle Tenasserim and Sikkim (Bingham Coll.).

*Anthophora himalayensis*, Rad., var. *pahangensis*, var. nov.

♀. *A. himalayensi* typico similis, sed terg. 1-3 fasciis apicalibus rufescente-pilosis.

♀. Similar to the typical form, but tergites 1-3 with apical fasciæ of rufous pubescence, that on tergite 3 widely broken medially.

PAHANG: Gunong Tahan (2500-3500 ft.), v.-vii. 1905 (*Herbert C. Robinson*), 1 ♀ (type); there is also a female from Mt. Ophir, Johore, 12th Aug. 1905 (*Dr. R. Hanitsch*), in bad condition, but probably belonging to this variety.

*Anthophora cingulata*, F.

*Megilla cingulata*, F., Syst. Piez. p. 332. no. 18 (1804).

*Anthophora cincta*, Dours (nec Fabr.), Mon. Icon. *Anthophora*, p. 58 (1869). ♀.

*Anthophora emendata*, Smith, New Spec. Hymen. Brit. Mus. p. 123 (1879). ♂ (nec ♀).

*Anthophora emendata*, Smith, var. *gilberti*, Ckll. Ann. & Mag. Nat. Hist. (7) xvi. p. 396 (1905). ♀.

The type of this species is in the Banks Collection in the British Museum. Smith incorrectly gives his type of *A. emendata* as a ♀, which accounts for Cockerell's description of a new variety. The type of *A. emendata* is a ♂, and the var. *gilberti*, Ckll., is certainly the female of the same species.

The two specimens from Clare, South Australia (Ann. & Mag. Nat. Hist. (7) xvi. p. 397, 1905), are erroneously recorded as this species.

*Emphoropsis carinifrons*, Cam.

This species, from Hacienda Guachala, Ecuador (*Ed. Whymper*), was described as *Habropoda*. Cockerell has already (Canad. Ent. xxxvi. p. 302) transferred Smith's Mexican species (also described as *Habropoda*) to *Emphoropsis*. *E. bombyformis*, Sm. (1879), is omitted from Dalla Torre's catalogues.

VII.—*Notes on Collembola*.—Part 2\*. *Some Irish Collembola and Notes on the Genus Orchesella*. By JOHN W. SHOEBOOTHAM, N.D.A., Berkhamsted.

[Plate III.]

*Some Irish Collembola*.

DURING the last two years I have made three visits to Ireland, and on each occasion have collected some springtails, though in the limited time at my disposal I did not have opportunity to search for them as much as I would have liked. A few notes, however, may be useful in giving fresh localities for the known species and to place on record the presence in Ireland of at least four species new to the country, viz. *Achorutes manubrialis*, *Tullbergia krausbaueri*, *Lepidocyrtus albus*, and *Megalothorax minimus*. The list of Irish species taken by me would have been larger but for the fact that I had the misfortune to break a tube in crossing back to England after my first visit, and the contents were lost. The collections have been made at the following places:—Blackrock, Co. Dublin; Dublin; Strabane, Co. Tyrone; Lifford, Co. Donegal; Portadown, Co. Armagh; Gilford, Co. Down; and Dundonald, Co. Down. All the species have been collected by the author.

Order COLLEMBOLA, Lbk.

Suborder ARTHROPLEONA, C. B.

Family Achorutidæ, C. B.†

Subfamily ACHORUTINÆ, C. B.

Genus ACHORUTES, Templ., Lbk.

1. *Achorutes viaticus* (Linn.), Tbg.

*Loc.* Portadown, ii. 1912, near manure heap (6).

\* The author intends publishing a series of parts of "Notes on Collembola" in this Journal. The previous paper (Ann. & Mag. Nat. Hist. ser. 8, vol. viii. pp. 32-39) is to be regarded as Part 1.

† The classification here adopted is one which, in the main, has been accepted by authors this last seven years. Dr. Börner has recently proposed a new system, on which I hope to make some notes at an early date.

2. *Achorutes purpurascens*, Lbk.

*Loc.* Strabane, ii. 1912, under stone (2); Portadown, iii. 1912, on flower-pots in a house (10); Giltford, iii. 1912, in greenhouse on surface of water in a tank (5).

3. *Achorutes armatus* (Nic.).

*Loc.* Portadown, iii. 1912, under stones (7).

4. *Achorutes manubrialis*, Tbg., var. *neglecta*, C. B.

*Loc.* Portadown, iii. 1912, on puddle of water (2).

The type form of this species, with two short, straight, anal horns on separated papillæ, has been found and recorded from Scotland and England; but the variety *neglecta* of Börner has only been previously recorded from Hertfordshire in the British Isles by Collinge and Shoebbotham (1910), pp. 100, 101.

## Subfamily ONYCHIURINÆ, C. B.

## Genus ONYCHIURUS, Gerv., C. B.

5. *Onychiurus armatus* (Tbg.).

*Loc.* Lifford, ii. 1912, under stone (3); Portadown, ii. 1912, under stones (4), iii. 1912, under flower-pots in a house (3); Dundonald, vi. 1913, under stones (3).

6. *Onychiurus ambulans* (Linn., Tbg.).

*Loc.* Lifford, ii. 1912, under stones (2); Portadown, ii. 1912, under stones embedded in loose garden soil (6); Giltford, iii. 1912, under a stone (2).

## Genus TULLBERGIA, Lbk., C. B.

7. *Tullbergia krausbaueri* (C. B.).

*Loc.* Lifford, ii. 1912, under a brick (2); Portadown, iii. 1912, under a stone (1).

This very slender white species, which is about 1 mm. long, is found sparingly in England under stones and bark, out of doors, and under flower-pots in greenhouses. This is the first record from Ireland.

Subfamily *NEANURINÆ*, C. B.

Genus *ANURIDA*, Laboulb.

8. *Anurida granaria* (Nic.).

*Loc.* Portadown, iii. 1912, under stones (7).

Genus *NEANURA*, MacG.

9. *Neanura muscorum* (Templ.).

*Loc.* Portadown, iii. 1912, under moist sticks (10).

Family *Entomobryidæ*, D. T.

Subfamily *ISOTOMINÆ*, Schffr., C. B.

Genus *ISOTOMA*, Bourl., C. B.

10. *Isotoma viridis*, Bourl., Schtt.

*Loc.* Portadown, iii. 1912, under log of wood on the ground (5); Dundonald, vi. 1913, under moist stick (2).

11. *Isotoma grisea*, Lbk. (Pl. III. fig. 1.)

*Loc.* Portadown, ii. 1912, under moist sticks on the ground (4); Dublin, iv. 1913, under stick (1).

The Dublin example of this species had the right antenna mutilated, the fourth joint being removed. I give an illustration of the head and antennæ, to show the attempt at reparation of the mutilated member. The normal number of joints is not regained, but the terminal segment increases in size and the damaged antenna then approaches the normal one in length.

12. *Isotoma arborea* (Linn.), Ågr.

*Loc.* Portadown, iii. 1912, under bark of tree (3).

13. *Isotoma sensibilis*, Tbg.

*Loc.* Portadown, iii. 1912, under bark of fence-post (2).

14. *Isotoma cinerea* (Nic.).

*Loc.* Portadown, iii. 1912, under moist stick (2).

Genus FOLSOMIA, Willem.

15. *Folsomia fimetaria* (Linn., Tbg.).

*Loc.* Dublin, iv. 1913, under a stone (1); Dundonald, vi. 1913, under a stone (1).

Genus ANUROPHORUS, Nic., Tbg.

16. *Anurophorus laricis*, Nic.

*Loc.* Portadown, ii. 1912, under bark of fence-post (8).

Subfamily TOMOCERINÆ, Schffr.

Genus TOMOCERUS, Nic.

17. *Tomocerus minor* (Lbk.).

*Loc.* Portadown, iii. 1912, under moist stick (2); Dublin, iv. 1913, under a brick (2); Dundonald, vi. 1913, under a stone (1).

Subfamily ENTOMOBRYINÆ, Schffr., C. B.

Genus ISOTOMURUS, C. B.

18. *Isotomurus palustris* (Müll.), var. *prasina* (Reut.).

*Loc.* Portadown, ii. 1912, under log of wood in a grass-field (3); Gilford, iii. 1912, under stick (2); Dundonald, vi. 1913, under moist stick (2).

Genus ENTOMOBRYA, Rond.

19. *Entomobrya nivalis* (Linn.).

*Loc.* Portadown, ii. 1912, under loose bark of apple-trees (7), iii. 1912, under bark of fence-post (3); Gilford, iii. 1912, under bark of fence-post (2); Blackrock, iv. 1913, under loose bark of apple-trees (4).

20. *Entomobrya albocincta* (Templ.). (Pl. III. fig. 2.)

*Loc.* Portadown, ii. 1912, under bark of fence-post (6), iii. 1912, on flower-pots in a house (6); Gilford, iii. 1912, under bark lying on the ground (3).

21. *Entomobrya multifasciata* (Tbg.).

*Loc.* Portadown, iii. 1912, under sticks (4); Gilford,

iii. 1912, under a board (3); Dublin, iv. 1913, under sticks (3).

Genus LEPIDOCYRTUS, Bourl.

22. *Lepidocyrtus lanuginosus* (Gmel.), Tbg.

*Loc.* Dundonald, vi. 1913, under stone (1).

23. *Lepidocyrtus cyaneus*, Tbg.

*Loc.* Portadown, iii. 1912, under stones and sticks (6).

24. *Lepidocyrtus albus*, Pack.

*Loc.* Dundonald, vi. 1913, under a stone (1).

This species is new to the Irish fauna. It should be looked for under stones, sticks, logs of wood, lying on or slightly embedded in soil, and amongst decaying leaves. It is fairly common in England, and may be recognized by the presence of two ocelli on each side of the head, on one small eye-spot.

25. *Lepidocyrtus cavernarum* (Mon.).

*Loc.* Dundonald, vi. 1913, under a stone (1).

This species was first recorded for Ireland by Prof. Carpenter from the Mitchelstown Cave in Co. Tipperary as a new species, *Cyphoderus martelii*; but Prof. Moniez, after examining the specimens, considered it synonymous with his *Seira cavernarum* from the Cave of Dargilan, in France. It has been recorded from both Scotland and England.

Genus ORCHESSELLA, Templ.

For some notes on this genus see the latter part of this paper.

26. *Orchesella cincta* (Linn.), Lbk. (Pl. III. figs. 3-6.)

*Loc.* Portadown, ii. and iii. 1912, under sticks (8); Dundonald, vi. 1913, under a stone (2).

Genus HETEROMURUS, Wank.

27. *Heteromurus nitidus* (Templ.).

*Loc.* Portadown, iii. 1912, under a stone (1).

Suborder SYMPHYPLEONA, C. B.

Family Neelidæ, Fols.

Genus MEGALOTHORAX, Willem.

28. *Megalothorax minimus*, Willem.

*Loc.* Portadown, iii. 1912, under flower-pot in a house (2).

I first discovered this species in Hertfordshire in 1908, and have since found it in all districts in England where I have specially looked for it. It is the smallest British springtail, measuring only .25 mm. long; the tiny size no doubt accounts for it having been overlooked. It may be found under flower-pots in greenhouses, and under boards, bark, stones, sticks, &c., out of doors. This is the first Irish record.

Family Sminthuridæ, Lbk.

Subfamily SMINTHURIDINÆ, C. B.

Genus SMINTHURINUS, C. B.

29. *Sminthurinus niger* (Lbk.).

*Loc.* Gilford, iii. 1912, in greenhouse on flower-pots (4); Portadown, iii. 1912, on flower-pots in house (6).

30. *Sminthurinus aureus* (Lbk.), var. *ochropus* (Reut.).

*Loc.* Dundonald, vi. 1913, under a stick on the ground (1).

Genus ARRHOPALITES, C. B.

31. *Arrhopalites cæcus* (Tbg.).

*Loc.* Portadown, iii. 1912, under flower-pots in a house (4).

Subfamily SMINTHURINÆ, C. B.

Genus BOURLETIELLA, Banks, C. B.

32. *Bourletiella signata* (Nic., Ågr.).

= *Smynturus hortensis*, Fitch.

*Loc.* Dundonald, vi. 1913, under board in a garden (1).

*Notes on the Genus Orchesella.*

The genus *Orchesella* was founded by Templeton (1835), p. 92, as follows:—"Antennæ 6- or 7-jointed, nearly as long



as the body, filiform; fork developed." Succeeding authors have accepted this genus, and most\*, including Tullberg (1872), p. 42, Lubbock (1873), p. 129, Börner (1901), p. 63, Carpenter (1906), p. 41, and Linnaniemi (1912), p. 232, give as one of the characters the presence of six eyes on each side of the head. I have examined three species of *Orchesella*, and have been able to find eight in each of them. It is true that two of them are much smaller than the rest; but if the insects are treated with caustic potash and examined, the full number will be observed. I give illustrations (Pl. III. figs. 6-8) of the eyes in the three species I have had the opportunity of examining, viz. *O. cincta*, *O. villosa*, and *O. flavescens*. In a paper on Hertfordshire Apterygota, Mr. Collinge and myself (1910), pp. 118, 119, gave as characters of *O. cincta* and *O. villosa*: "Eyes, 8 on each side of the head."

*Orchesella anomala* (Carp.), mihi.

*Entomobrya anomala*, Carpenter, (1906) pp. 40-42, pl. ii. figs. 8-15.

In June 1905 Prof. Carpenter collected some springtails from Fair Head, Co. Antrim, and in 1906 described them as a new species of *Entomobrya* of somewhat aberrant type, because of the relatively short fourth abdominal segment and the presence of six distinct segments in the feeler, these being characteristic of the genus *Orchesella*. Prof. Carpenter was under the impression that *Orchesella* possessed only six eyes, and regarded the extreme reduction of the two hinder median ocelli (Guthrie's G and H) in *E. anomala* as being an approach towards *Orchesella*. Having shown above that eight is the normal number of eyes, I include Carpenter's *anomala* in *Orchesella*.

Another character by which the two genera may be separated is by the end-knob of the antenna, this being present in *Entomobrya*, but absent in *Orchesella* (see figs. 2, 3).

The presence of (so-called) 6-segmented antennæ has been given as a feature of the genus *Orchesella*. This is only partially correct, for young specimens have 4-jointed antennæ, but as they grow older the first two joints each divide into

\* Since writing the above, I have obtained a copy of a paper by Guthrie (1906) on the Collembolan eye, in which (p. 240) he gives the correct number of eyes. He also suggests that the individual ocelli are probably homologous in all the different species, and that they are arranged more or less in a certain pattern, somewhat in the shape of the letter S. He has assigned letters A-H to the eight eyes, and I have lettered them in the same order in my illustration of the eye-spot of *Orchesella villosa*.

two, and we have them 6-jointed. There is, however, no true articulation between the subdivisions, and the antennæ are little, if at all, bent at these points. A similar process of subdivision takes place in the genus *Heteromurus*, Wankel (= *Templetonia*, Lubbock), except that only the first segment is divided, resulting in 5-jointed antennæ. This has been illustrated in the case of *H. nitidus* (Templ.) by Börner (1901), p. 78, fig. 33.

I regard all species of *Collembola* as having primarily 4-jointed antennæ, and these may be secondarily divided as above, or ant. iii. and iv. may be divided as in the genus *Ptenothrix*, or only ant. iv. as in *Arrhopalites* and some other genera of the *Sminthuridæ*.

*Orchesella flavescens* (Bourl.), Ågr., in England.

= *Heterotoma flavescens*, Bourlet (1839).

*Orchesella rufescens*, Lubbock, (1862) p. 592.

*Orchesella flavescens*, Ågren, (1903) pp. 149-151.

This species has been recorded from England under the name of *O. rufescens*; but Ågren, in his paper on the Aptérygotal Fauna of South Sweden (1903) has shown that it should be known as *O. flavescens* of Bourlet, the earlier references to *Podura rufescens* being insufficient for identification. It is apparently not very common in England, for it has only been found and recorded on few occasions. The early records, however, for England seem to have been overlooked, for Bagnall (1908), p. 82, includes *Orchesella rufescens* from Delamere Forest, Cheshire, in a list of "Additions to the Fauna of Great Britain," and (1909), p. 504, writes of it being "found not uncommonly in Delamere Forest," and "though this is a widely distributed European species, and is a common one in many countries, it is only now that we are able to record it as a British Insect."

The previous references to this insect in England are as follows:—

Lubbock (1862), p. 592, says of *O. rufescens*:—"The body is rather narrow, and much less heavy than in the *other English species*." The paper is written of *Collembola* found by Lubbock since writing Part I. of his "Notes on the Thysanura," and for some of the species he mentions Kent as a locality; so that I regard the above as a distinct record of the species from England.

Sir John Lubbock, in his *Monograph* (1873), himself seems to have overlooked the fact that he had previously found and recorded this species, for (p. 134) he says:—"The following

species have not been met with in England," and includes *Orchesella rufescens*, and on p. 135 he says "I have not yet met with it in England," though he remarks that he had found it very common in woods in Switzerland (which he visited in 1869).

Lubbock seems to have maintained this view, because in a note in Proc. Ent. Soc. for 1879, p. 44, it is recorded that "Sir John Lubbock exhibited a specimen of *Orchesella rufescens* taken in Kent, being a species of *Collembola* new to Great Britain."

It is difficult to reconcile these statements, but I can only suppose that Lubbock had overlooked his specimens and record of 1862 when he published his Monograph eleven years later.

The following are the English records of *Orchesella flavescens=rufescens*:—

Lubbock (1862), p. 592.—England.

„ (1880), p. 44.—Kent.

Bagnall (1908), p. 82.—Delamere Forest, Cheshire.

„ (1909), p. 504.— „ „ „

To these I am able to add the following, collected by myself:—

Froghall, Staffs.—One specimen, ix. 1909.

Berkhamsted, Herts.—Three specimens, ii. 1911.

Ashley Green, Bucks.—Four specimens, iii. 1911.

I do not know of any other records for the British Isles.

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#### EXPLANATION OF PLATE III.

- Fig. 1. *Isotoma grisea*, Lbk. Head from the side, showing mutilated right antenna with three joints in comparison with the 4-jointed normal left antenna. The illustration shows the increased size of the terminal segment of the mutilated antenna.
- Fig. 2. *Entomobrya albocincta* (Templ.). End of antenna, showing presence of end-knob.
- Fig. 3. *Orchesella cincta* (Linn.), Lbk. End of antenna, showing absence of end-knob.
- Fig. 4. *O. cincta*. Outline of right antenna, showing subdivision of ant. i. and ii., making the antenna appear 6-jointed.
- Fig. 5. *O. cincta*. End of ant. iii., showing the antennal organ iii.
- Fig. 6. *O. cincta*. Left eye-spot, with eight ocelli.
- Fig. 7. *O. villosa* (Geoffr.), Lbk. Right eye-spot, with eight ocelli. The lettering A-H on the ocelli is in the same order as suggested by Guthrie (1906).
- Fig. 8. *O. flavescens* (Bourl.), Ågr. Left eye-spot, with eight ocelli.

#### VIII.—Two interesting Mammals from the Island of Tobago, West Indies. By AUSTIN H. CLARK.

MR. W. E. BROADWAY, of the Botanic Station, Scarborough, Tobago, has recently sent me the skins of two mammals representing species one of which is as yet unrecorded from that island.

Unfortunately both of the skins are imperfect, and the skulls of both are missing; but the interest attaching to them

appears to be sufficient to warrant the publication of a short note upon them.

It has seemed unnecessary to include the synonymy of these species, as both are treated in considerable detail by Glover M. Allen in his recent paper on the mammals of the West Indies (Bull. Mus. Comp. Zool. vol. liv. 1911, no. 6, pp. 175-263).

*Marmosa tobagi*, Thomas.

*Local name.*—Manicou Rat; known on Grenada and the Grenadines as Manicou Gros-yeux.

*Material.*—One imperfect skin, unsexed, and without the skull.

Compared with a specimen of *Marmosa chapmani* from Trinidad in the collection of the U.S. National Museum this example is found to be somewhat more greyish dorsally, while the cinnamon along the sides is paler. The ear is much smaller, measuring only 17 mm. in length. The hind foot is noticeably smaller. The specimen from Trinidad is a male, while there is a possibility that the one from Tobago is a female, and a probability that it is young.

Dr. Glover M. Allen states that two specimens which he obtained on Grenada "are identical in size and cranial measurements with a topotype of *M. chapmani* from Caura, Trinidad; they are, however, slightly paler cinnamon along the sides. . . ."

Mr. Oldfield Thomas has recently described the *Marmosa* occurring on Tobago under the name of *Marmosa tobagi*. Though the characters separating this form from *M. chapmani* do not appear to be of much significance, it has seemed best to use the name at least until a good series from Tobago is available for study.

*Remarks.*—Mr. Oldfield Thomas has described the "manicou gros-yeux" of Grenada under the name of *Marmosa grenadæ*; but Allen can find no difference between the specimens from Grenada and those from Trinidad except the very slight one in the colour, which he says "is apparently not more than individual variation."

It is quite possible that the murine opossum was unintentionally introduced by man into the Grenadines, and perhaps into Grenada also, from Trinidad, for its presence in the fauna of these islands is somewhat anomalous, and, on account of its small size and nocturnal and secretive habits, it is the most easily carried from place to place, concealed in

bunches of bananas or in other similar hiding-places, of all the mammals of Trinidad.

In the West Indies the murine opossum (*Marmosa*) occurs on the islands of Carriacoú and Isle Ronde in the Grenadines, as well as on Grenada, Tobago, and Trinidad.

*Dasypus novemcinctus hoplites*, G. M. Allen.

*Local name*.—Tattoo ('Tatu).

*Material*.—One imperfect skin, without fore limbs or skull, and with the tip of the tail broken.

The measurements are :—

|   | mm. |
|---|-----|
| Frontal shield .....                              | 54  |
| Scapular shield .....                             | 69  |
| Thoracic rings (9).....                           | 68  |
| Pelvic shield .....                               | 95  |
| Tail .....  | 240 |
| Tail to the distal edge of the twelfth bony ring. | 165 |

*Remarks*.—This specimen evidently represents a dwarf form of *Dasypus novemcinctus*, very nearly related to, if not, the *Dasypus novemcinctus hoplites* of Grenada.

Armadillos were first reported from Tobago in 1658 by C. de Rochefort, who remarked upon the small size of the local form; but no definite record of the species inhabiting the island has ever been published.

On Grenada armadillos have been known to occur since 1667, when they were reported as common there by Père du Tertre, who also mentioned that all attempts to introduce them into other of the (then) French islands had met with failure. During a visit of some weeks to Grenada in 1904 I found that armadillos were not at all uncommon there, though I did not succeed in securing any specimens. For some years the local form had been regularly recorded in the 'Grenada Handbook' under the name of *Dasypus novemcinctus*. In a paper published in 1905 ('The Auk,' vol. xxii., July 1905, pp. 270, 271) I wrote, "To-day Grenada is the only island (except, of course, Tobago and Trinidad) where the Armadillo is found," and remarked that it was still called there by the same name, Tatu, under which it was referred to by du Tertre and Labat. In 1910 Dr. G. M. Allen visited the island and secured three specimens, upon which he based, in the following year, the name *Dasypus novemcinctus hoplites*.

The typical form, *Dasypus novemcinctus novemcinctus*, occurs in Trinidad.

IX.—On an interesting Variety of *Porcellio scaber*, Latr.

By WALTER E. COLLINGE, M.Sc., F.L.S., F.E.S.

WELL-MARKED variations amongst the British Terrestrial Isopoda, apart from colour-variations, are by no means common. To some extent this is probably due to the fact that the different species have not received the same attention as have those of other groups.

I have recently received from Mr. P. A. Aubin, of St. Helier, Jersey, Channel Isles, who has given me most valuable assistance in my studies of the Channel Island species, a very interesting variation, which I think is worthy of recording.

*Porcellio scaber*, Latr., var. *aubini*, nov.

Colour a creamy white, with a few small sepia or slaty-coloured dashes. First segment of the mesosome strongly convex, giving the head a somewhat tucked-in appearance. The backward curve of the lateral plates less acute. Tubercles fewer, less prominent, and more irregular in arrangement. Distinct transverse ridge on the tergum of the last thoracic segment. Lateral lobes of cephalon smaller and of a different contour to type; frontal lobe less prominent. Basal joint of antennæ smaller. Uropoda: exopodite more contracted proximally, giving the appendage a more conical shape.

*Hab.* From wet moss growing on face of a road cutting through shale; St. Helier, Jersey, Channel Isles.

I have pleasure in associating with this interesting variety the name of Mr. Aubin.

I may mention that I have taken a very similar colour-variety, *without the above structural differences*, in Cheshire, Warwickshire, Worcestershire, and Staffordshire; but, holding the view that colour-variations, especially in the Isopoda, are of very little importance unless associated with structural differences, I have not previously recorded them.

X.—*Notes on the Forficularia.*—XX. *A new Genus and Five new Species from Australia.* By MALCOLM BURR, D.Sc., F.E.S., &c.

[Plate IV.]

THE Dermaptera of Australia have been neglected by collectors, and it is only quite recently that I have seen any fresh material. I have now, however, enlisted the co-operation of Mr. R. Hamlyn Harris, Director of the Queensland Museum, Mr. F. P. Spry, of Melbourne, and Mr. F. P. Dodd, of Kuranda, Queensland, from whom I have received a number of interesting species. The hitherto unknown ones are now described for the first time. In two instances the genital armature is figured and briefly described in a provisional manner.

Subfamily *PYGIDICRANINÆ*.

*Dicrana hackeri*, sp. n.

Parva, gracilis, pallida, fusco-ornata; forcipis brachia ♂ contigua; segmentum penultimum ventrale quadratum, margine postico utrinque emarginato, lobulo medio acuto.

|                      |        |
|----------------------|--------|
|                      | ♂.     |
| Long. corporis ..... | 16 mm. |
| „ forcipis .....     | 2 „    |

Small and slender; colour pale tawny or buff, with blackish markings; head flat, buff; pronotum slightly longer than broad, and slightly narrower posteriorly than anteriorly, anterior margin rounded, posterior truncate, sides subparallel; elytra long, blackish, with a median long buff band; wings perfect, banded with buff and blackish; scutellum ample, buff, nearly equilateral; legs buff and hairy; abdomen buff at the base, passing to deep red apically, scarcely dilated; last dorsal segment nearly square, deep red, smooth, unarmed; penultimate ventral segment ♂ quadrate, posterior margin emarginate on each side, with a feeble lobe in the middle. Forceps with branches contiguous, depressed, deep red, rather broad, straight, the tips gently curved.

QUEENSLAND: Brisbane, 1 ♂, 26. vi. 11 (*Hacker*, in Mus. Brisbane); Kuranda (*Dodd*, in c. m.).

The type will be deposited in the British Museum.

This is a delicate little species, well characterized by the form of the penultimate ventral segment of the male.



*Pyge shortridgei*, sp. n.

Colore fusco-testaceo, nigro-marmorato; forcipis brachia ♂ remota, valde arcuata, apice bimucronata.

|                |       |    |        |
|----------------|-------|----|--------|
| Long. corporis | ..... | ♂. | 20 mm. |
| „ forcipis     | ..... | 4  | „      |

General colour dark testaceous, marbled and mottled with blackish, strongly pubescent.

Antennæ testaceous.

Head dark testaceous, indistinctly shaded with fuscous.

Pronotum about as broad as the head, parallel-sided; posterior margin straight, angles gently rounded; anterior margin distinctly convex, rounded, dark testaceous, with two indistinct blackish bands.

Scutellum broad, testaceous, banded with blackish.

Elytra narrow and short, dark testaceous, with indistinct blackish bands.

Legs dirty yellowish, indistinctly shaded with dark brown.

Abdomen testaceous, with a double black dorsal band and one down each side; gradually widening from base to apex, where the yellowish and blackish fuse into a uniform deep reddish brown. Venter dirty testaceous; last dorsal segment square, ample, smooth, broader than the abdomen, deep red-brown, with some faint blackish pattern.

Penultimate ventral segment broad and quadrate; posterior margin truncate, with a median canal in the apical half.

Pygidium hidden.

Forceps with the branches remote at the base, depressed and dilated at the base itself on the inner margin; strongly arched, including a scutiform area, meeting before the apex at a very blunt tooth, finely crenulate here, the inner margin then straight and contiguous to the tips, which are hooked.

W. AUSTRALIA: 1 ♂ (*G. C. Shortridge*, type in B. M.).

This is the only known species of *Pyge* with remote forceps and mottled uniform, recalling that of the South-African *Picrania liturata*, Stål. The forceps are very characteristic, and especially the square and sulcate penultimate ventral segment, which may later justify the erection of a new genus.

Subfamily *PARISOLABINÆ*.

## PARISOPSALIS, gen. nov.

Antennæ 15-segmentis, tertio elongato, 4 et 5 tertio brevioribus,

sed sat elongatis, haud globularibus, ceteris elongatis, pyriformibus, basi valde gracilibus, apice clavatis; prosternum parallelum; meso- ac metasterna rectangularia, postice truncata; abdomen ♂ medio dilatatum, segmentis lateribus acutis; segmentum ultimum ♂ transversum, rectangulare; forcipis brachia ♂ remota.

In the dilated abdomen approaches *Parisolabis*, Verh., but differs in the rectangular last dorsal segment and acute sides of abdominal segments. In the long pyriform antennal segments it differs both from *Parisolabis*, Verh., *Pseudisolabis*, Burr, and *Idolopsalis*, Bor.

*Parisopsalis spryi*, sp. n.

Glabra, nigro-rufescens; abdomen ♂ medio fortiter dilatatum, segmentis 2-9 lateralibus fortiter recurvis, acutis, segmentis singulis postice rufescentibus; segmentum ultimum dorsale transversum, inerme; forcipis brachia basi remota et conica, recta, apice valde attenuata ac fortiter arcuata.

|                      |        |
|----------------------|--------|
|                      | ♂.     |
| Long. corporis ..... | 14 mm. |
| „ forcipis .....     | 2.5 „  |

Reddish black, glabrous; head broad, smooth, depressed, black; antennæ blackish brown.

Pronotum almost rectangular, very gently widened posteriorly, a little broader than long, sides all straight; mesonotum densely punctulate; metanotum densely punctulate, very short; legs slender, femora fuscous, tibiæ and tarsi dirty yellowish.

Abdomen depressed, strongly dilated about the middle; narrowed apically, both ventral and dorsal surfaces deep reddish black, the posterior portion of each segment in the hinder half of the abdomen clear brick-red, the black part finely and densely punctulate, the red part smooth; the sides of each segment except the first produced into an acute strongly recurved hook, the outer edge of which is keeled, and rugulose above and below the keel; last dorsal segment transverse, rectangular, unarmed, smooth, the posterior margin gently concave, and feebly swollen into an incipient tubercle over the roots of the forceps.

Penultimate ventral segment rounded.

Forceps with the branches remote at the base, stout, trigonal, conical, straight in basal third, tapering apically, and near the apex strongly and abruptly arcuate.

AUSTRALIA: Victoria, Warburton District, Christmas 1902,

2 ♂; Cape Otway Ranges, Feb. 1913, 2 ♂, 2 ♀ (*Spry*). *Type* in c. m.

I am indebted to Mr. F. P. *Spry*, of Victoria, for this interesting species; its appearance and the recurved abdominal hooks, recalling those of *Ancistrogaster*, render it easily recognizable.

Two of the males are ill-developed specimens; the dilatation of the abdomen is much less pronounced and the forceps are only gently arcuate apically; consequently the whole appearance is very different from that of the type, and at first I considered it a distinct species. But for the fact that there are nine abdominal segments, I should have regarded them as females.

But the differences are merely of degree, and not of kind; as they were taken at the same time and place as the typical examples, I am of opinion that they are only ill-nourished and feebly-developed specimens.

As to the genital armature, the apical segments of the metaparameres are narrow, almost parallel-sided, gently concave, about as long as the proparameres; the virga is short and rather broad, somewhat inflated towards the apex.

#### Subfamily SPONGIPHORINÆ.

##### *Marava doddi*, sp. n.

Rufo-castanea; elytra indistincte vittata; pygidium ♂ valde productum, basi lateribus triangulariter lobatum, apice fissum; forcipis brachia ♂ remota, subrecta, apice incurva.

|                          |           |
|--------------------------|-----------|
|                          | ♂.        |
| Long. corporis . . . . . | 6-8.5 mm. |
| „ forcipis . . . . .     | 2.5 „     |

Small; reddish chestnut; antennæ with thirteen to fourteen segments, brown, feebly obconical, fourth a little shorter than third; head broad, dark brown or black; pronotum broadened posteriorly, yellowish anteriorly, darker posteriorly; elytra smooth, deep brown, with an indistinct yellowish band; wings brown; legs yellow, femora banded with fuscous, the anterior pair decidedly thickened; second tarsal segment long, nearly equal to the third; abdomen deep reddish chestnut, darker at the sides, pliciform tubercles distinct; last dorsal segment smooth, black, transverse; ninth sternite ample, quadrate; pygidium very large and prominent, produced into a long lobe, with a triangular dilatation on each side near the base, then nearly parallel-sided,

deeply incised at the apex, with pointed lobes; branches of forceps straight, simple, unarmed, strongly hooked at the apex.

QUEENSLAND: Kuranda, 2 ♂♂ (*Dodd*). *Type* in my collection.

This and the following species are very closely allied. The form of the pygidium is quite distinctive, but only the apical portion is really noticeable, the basal triangular lateral dilatations being quite hidden in one specimen and only just discernible in the other. One specimen is macropterous, the other brachypterous.

*Marava hackeri*, sp. n.

Para, fusco-castanea; elytra flavo-vittata; pygidium ♂ breve, latum, obtusum, margine postico lateralis minimis 4 instructo; forcipis brachia ♂ remota, gracilia, elongata, recta, intus medio dentata.

|                          |               |
|--------------------------|---------------|
|                          | ♂.            |
| Long. corporis . . . . . | 6.5 - 7.5 mm. |
| „ forcipis . . . . .     | 2.75 - 3 „    |

Slender and small; reddish chestnut; antennæ greyish brown, the two basal segments yellow; head broad, blackish brown; pronotum broadened posteriorly, deep brown, with a broad yellow border on each side; elytra deep brown, with a yellow band; wings long, deep brown, with a big yellow spot; legs yellow, indistinctly banded with fuscous; abdomen deep red, darker at the sides; last tergite smooth, with feeble tumidities over the insertion of the forceps; pygidium ♂ short, broad, tumid, with four minute tubercles on posterior margin; forceps with the branches remote, slender, straight, with a small median tooth.

Apical segment of parameres broader than the basal, with gently rounded margins, broadened towards the apex and then abruptly attenuate and acute; virga long and convoluted, inflated at one end, terminating in a U-prong at the other.

QUEENSLAND: Tambourine Mts., 27th Nov., 1912 (*Hacker*). Four ♂♂ in Mus. Brisbane and c. m.

The type will be deposited in the British Museum.

This species resembles the preceding, but is of rather more slender build and a little longer. The form of the pygidium and forceps is quite different.

*Marava victoriæ*, sp. n.

*M. hackeri* vicina; differt pygidio ♂ margine postico in lobum triangularem producto.

|                      |           |           |
|----------------------|-----------|-----------|
|                      | ♂.        | ♀.        |
| Long. corporis ..... | 6-6.5 mm. | 7-7.5 mm. |
| „ forcipis.....      | 2-2.5 „   | 1 „       |

In colour closely resembles *M. hackeri*, but tints a little deeper and markings less defined; agrees in every respect except the pygidium ♂, which is produced into a depressed, rather obtuse, triangular lobe, with a point at each side and one at the apex.

VICTORIA: Fern Tree Gully, 6 ♂♂, 4 ♀♀ (*Spry*, c. m.).

This species very closely resembles *M. hackeri*, but the pygidium is quite different; the lateral points are often scarcely discernible, the apical point being the most prominent and often the only one noticeable.

## EXPLANATION OF PLATE IV.

- Fig. 1. *Dicrana hackeri*, sp. n. ♂,  $\times 2\frac{1}{2}$ .  
 Fig. 2. *Pyge shortbridgei*, sp. n. ♂,  $\times 2\frac{1}{2}$ .  
 Fig. 3. *Parisopsalis spryi*, sp. n. ♂,  $\times 2\frac{1}{2}$ .  
 Fig. 3 a. Ditto. Profile of abdomen. ♂.  
 Fig. 4. Ditto. Genital armature. ♂.  
 Fig. 5. *Marava doddi*, sp. n. ♂,  $\times 4$ .  
 Fig. 6. Ditto. Forceps and pygidium. ♂,  $\times 8$ .  
 Fig. 7. *Marava hackeri*, sp. n. ♂,  $\times 5$ .  
 Fig. 8. Ditto. Forceps and pygidium. ♂,  $\times 8$ .  
 Fig. 9. Ditto. Genital armature.  
 Fig. 10. *Marava victoriæ*, sp. n. ♂,  $\times 5$ .  
 Fig. 11. Ditto. Forceps and pygidium.  $\times 10$ .

XI.—Notes from the Gatty Marine Laboratory, St. Andrews.—No. XXXVI. By Prof. M'INTOSH, M.D., LL.D., F.R.S., &c.

[Plates V. & VI.]

1. On the Ventral Furrows of the Lesser Rorqual (*Balænoptera rostrata*, O. Fabricius).
2. On some of the Species of *Prionospio*, Malmgren.
3. On the British *Amphictenidæ*.
4. On the British *Ampharetidæ*.

1. On the Ventral Furrows of the Lesser Rorqual  
 (*Balænoptera rostrata*, O. Fabricius).

IN the numerous accounts of the structure of this species, from J. Hunter and R. Knox to Sir William Turner, the

exact conditions of the ventral furrows diverges from that seen in the accompanying photograph\* of an adult female lately stranded at Crail, on the Forth, and measuring 30 feet in length. For instance, in the figure given by Drs. Carte and Macalister†, the furrows preserve a nearly uniform arrangement from the symphysis of the mandible to the navel, thus resembling corduroy, the figure being less accurate than the description, which is that beneath the mandible the furrows "were flat and inconspicuous, but as they extended down towards the thoracic region they became enlarged and much more numerous; subsequently, as they approached the abdominal parietes, they decreased in number but increased in width, being finally lost in the neighbouring skin." The folds are seen in the photographs given by Sir William Turner, and in one‡ a single split is observed. This distinguished anatomist states that "the average breadth of the ridges between the furrows immediately below the angle of the mouth was about 1 inch, but further back some were as wide as 2 inches." Mr. Perrin§ specially notes that the folds did not decussate in a female of 13 feet or decrease in number from before backward. As no mention is made of the furrows splitting, it is possible that the condition in the female stranded at Crail may be exceptional. The total number of the furrows could not be counted, but the majority are shown in the photograph, viz. about forty (Pl. V.). Just below the eye two of the narrow ridges fuse and continue to the flipper, which in the specimen had been removed, so that the downward curvature of the furrows at the axilla could be distinctly seen. In the same way the two furrows following the adjoining one fused just before the anterior edge of the flipper. An entire ridge followed, widening, like the rest, behind the flipper, and disappearing on the side of the whale. The next two narrow ridges from the angle of the jaw fused slightly in front of the previous pair, the single ridge widening and disappearing as before. An entire ridge came next, followed by another similar in front, but its broad part behind the flipper was split into two moderate ridges, the fork nearly reaching its edge. The succeeding ridge was formed of two narrow ones, which united in a line with the eye. Three ordinary and simple ridges followed, then came another which, a little behind a line with the eye, split into two, which coursed

\* Taken by Mr. A. W. Brown, of the Gatty Marine Laboratory.

† *Philos. Trans.* vol. clviii. pl. iv. fig. 1.

‡ 'Marine Mammals, University Museum, Edinburgh,' p. 60 (1912).

§ *Proc. Zool. Soc.* 1870, p. 867.

backward behind the flipper, where the lower (or inner) one rather rapidly widened and split into two, which became broader, as usual, in their backward progress. The next furrow was very narrow under the jaw, but gradually increased into a broad ridge in its course along the region behind the flipper. The succeeding narrow ridge split about the middle of the sublingual region, the left ridge running backward to a point considerably behind the flipper, where it ceased, nearly in a line with the letters J. P. cut into the skin, a single broad ridge (3 inches) passing backward behind this point. But the second or inner ridge formed by the split was still more interesting, for it terminated by fusing with the narrow ridge to its inner or right side about a line midway between the eye and the anterior border of the flipper (insertion of), the single ridge then coursing backward to join the previous one in forming the broad abdominal ridge (3 inches) formerly mentioned. The sublingual ridge to the right split about a transverse line from the mandibular condyle, the separating furrow ending a little in front of the previous one and the letters J. P., a broad ridge not quite 3 inches remaining to the rear. Two subgular ridges to the right, fused at a line a little in front of the flipper, contracted to a narrower single ridge, the furrow ceasing under the letters J. P., leaving posteriorly a broad smooth area more than double the breadth of the widest ridge previously described. The adjoining furrow to the right presented a rudimentary split at its inner edge in a line with the flipper, but it soon ceased, and the furrow to the right terminated a little short of the previous one. The next ridge (to the right) was split about the middle of the sublingual region, its lower limb forking again in a line with the eye, whereas the next one (also to the right) fused with its neighbour to form a single ridge at the same line. The ridges slightly widen from the articulation of the mandible forward to its edge, the narrowest part being the region of the throat, and some below the eye are short, ending after a brief course on the side or fusing into a single ridge. Moreover, whilst the ridges, as a rule, are pale, the furrows have much dark pigment. This description leaves about half the series (to the right) untouched, but it will suffice to indicate that, whilst there is truly a parallelism in the ridges, the condition is more complex, as the accompanying photograph will show. Mr. Beddard and others are inclined to think that these ridges are useful to the animal in distention of the mouth and gullet in taking food (fishes &c.), but, as they also

occur on the thorax and part of the abdomen, this view is not without doubt.

So far as can be observed in the photographs given by Sir William Turner\*, and from other figures, no uniformity exists in the occurrence of the fissures in the ridges, which in this species are narrow and fine in front in comparison with those in the common rorqual, and still more in contrast with the massive ridges in *Megaptera*. Yet in the common rorqual the junction of two of the jugal ridges occurs several times on each side, and in their course backward several of the large ridges are split into two.

## 2. *On some of the Species of Prionospio, Malmgren.*

A Canadian *Prionospio*, dredged by Dr. Whiteaves in the Gulf of St. Lawrence, Canada, presents certain differences from that described by Malmgren, while approaching that of Sars. No complete example is in the collection and no satisfactory fragment of the posterior end, all presenting signs of mutilation and regeneration. The proboscis was extruded in every case, so that the snout was more or less distorted, the protruded organ forming a button-like process on the end of a short cone. The snout (Pl. VI. fig. 1) had the ordinary truncate anterior border without a trace of eyes, but on the dorsum a cephalic ridge extended along the median line and terminated posteriorly in a pointed process like an adnate tentacle about the line of the third feet. The body presented the normal outline, and when complete probably had about one hundred segments, the number given by Malmgren for the northern species.

In the anterior third of the body a transverse section presents well-developed cuticle and hypoderm, the latter especially being thick in the lateral processes and on the ventral surface external to and at the sides of the nerve-cords. The dorsal longitudinal muscles are of average size, and the inner ends are slightly tapered as they approach the middle line above the dorsal blood-vessel. The ventral longitudinal muscles, which occupy a limited elliptical area, are also of average bulk, and in section show vertically curved fasciculi externally and nearly horizontal fasciculi internally. In this region a powerful series of fibres passes from the dorsum about the middle of the longitudinal muscle, which is pierced, to the mid-ventral surface, probably

\* *Op. cit.* pp. 60 & 61.



in connection with the proboscis, which forms a comparatively large and thick-walled organ with a foliate arrangement of its mucous lining; an external coat of longitudinal and an internal layer of circular muscular fibres, besides the external sheath, are present. The mid-dorsal and mid-ventral vascular trunks are large, the latter lying between the ventral ends of the strong oblique muscles, which are inserted over the neural canals, which are large and situated at the upper border of the nerve-area, the rest of the area being hypodermic.

The first foot in a Canadian example (Pl. VI. fig. 2) is minute and consists of a fan-shaped dorsal lamella and a smaller ventral one of ovoid outline, one side forming the adherent base. In front of the dorsal lamella is a group of strong tapering bristles, with a basal curvature and a very finely tapered tip, the centre of each being minutely granular, whilst the slender tip is homogeneous. The ventral tuft is composed of bristles almost straight, but having as finely tapered tips. No wings could be defined in the bristles of this foot, and the tufts were nearly equal in size.

In the second foot of the Canadian form (Pl. VI. fig. 3) the dorsal lamella has become broadly lanceolate, its lower border being bluntly round, the upper somewhat pointed. The ventral lobe is elongate-ovoid, with the free end pointing downward. The curvature of the dorsal bristles is less marked, the centre of the shaft is less distinctly granular, and there is a barely visible trace of a wing. The ventral bristles, on the other hand, are more evidently curved, are larger, and of two kinds—longer, curved, finely tapered forms, with minute granules in the shaft, and a finely tapered tip, without wings; and shorter bristles, with translucent shafts, narrow wings, and finely tapered tips.

The third foot of the Canadian form has a considerably larger dorsal lamella, and has the pinnate process in front, but it carries no branchia. The next two feet (fourth and fifth), however, bear well-developed branchiæ (Pl. VI. fig. 4), that following (sixth) having a conspicuous dorsal lamella and a pinnate process on each side. In the succeeding feet the dorsal lamella gradually diminishes, so that at the fourth from the posterior pinnate process both lamellæ are much reduced, and the capillary bristles thus rendered conspicuous. Posteriorly the lobes of the feet diminish greatly, whilst the dorsal bristles become longer and so slender as to be hair-like. Ventrally hooks take the place of the inferior bristles from the fifteenth foot backward. In this form the pinnate or papillose cirri (Pl. VI. fig. 1, *t.*) were sparsely covered

by the somewhat long clavate papillæ, which became shorter and ceased about the commencement of the distal third of the process, and thus contrasted with conditions in the *Prionospio plumosa* of Sars. The dorsal bristles consisted of winged forms (Pl. VI. fig. 5) and of others in which the wing was not distinct, but which had the axis granular and so arranged in some as to give a transversely barred appearance (Pl. VI. fig. 6). In the middle of the body the ventral hooks, besides a few very slender capillary forms, had at the ventral edge a single strong curved bristle (Pl. VI. fig. 7). The hooks were rather slender and long, with a main fang and two or three teeth above it in a lateral view (Pl. VI. fig. 8).

The branchia is apparently broader than Malmgren's figure would indicate, and broader than the form described by Sars or in that from the 'Valorous,' but it is less elongate than that of the British form, the *Prionospio malmgreni* of Claparède.

Lately Mr. R. Southern, who is doing so much good work amongst the Irish Annelids, procured in a tow-net attached to the trawl off Balbriggan, and also on muddy ground at various parts of the Irish coast, small specimens of a *Prionospio*, two of which he kindly sent me. He refers to this form as *Prionospio steenstrupi*, Malmgren \*, but it agrees rather with the form described by Claparède \* as *P. malmgreni*.

The minuteness of the preserved specimens made it difficult to determine the presence or absence of a cephalic ridge ; but, so far as could be seen, it was indicated. The head terminates anteriorly in a truncated snout, with four eyes—two rounded, anterior, composed of several crystalline spheres and dark pigment, and after an interval two elongated or kidney-shaped masses of pigment. This form is thus in contrast with the Canadian, in almost every example of which, as mentioned, the extruded proboscis had distorted the snout. The proboscis in the latter had a slightly tapered basal process with a button-like tip. A prominent cephalic ridge occupied the centre of the dorsum, and terminated posteriorly in a pointed process like an adnate tentacle. It closely agrees, however, with *P. malmgreni* of Claparède.

The body is elongated, resembling posteriorly that of a small Nereid, but anteriorly characteristically enlarged and gently tapering posteriorly to the vent, which has two cirri. Claparède's examples were all small, viz. 11–12 mm., yet the females were mature, a bunch of orange ova occurring on each side of the intestine behind the fifteenth segment.

\* Annel. Chétop. Napoli, p. 333, pl. xxii. fig. 3.

In his original description Malmgren describes the branchiæ as four pairs, the basal region of the long tapering forms as pinnate, the distal as filiform (referring to the elongate pinnate organs of the front and rear of the anterior region). He, however, observes that these are longer than the branchiæ of his second and third segments (for he apparently overlooked the minute anterior feet), yet he does not differentiate these from the dorsal lamellæ of the feet, which are truly lanceolate, whilst the true branchiæ, which he apparently represents in his fig. 55 A, Taf. x., are broadly strap-shaped, only a little tapered at the tip, which ends in a conical process or mucro. Moreover, they are closely striated transversely and richly ciliated, whereas the pinnate processes and the lamellæ of the feet are not. Claparède, again, expressed doubt as to the actual number of branchiæ, from the facility with which these delicate organs break off. He, however, considered the pinnate cirri as branchiæ, though he found no cilia on them. In his figure (pl. xxii. fig. 3) none of the ligulate (true) branchiæ are shown, and the position of the posterior pair of the pinnate cirri is faulty.

In the first foot the dorsal and ventral lamellæ are rounded and rudimentary, and the tufts of bristles small; moreover, the granular condition of the axis of the bristle was not made out. The second foot has the dorsal lamella of a lanceolate outline, whilst the ventral is rounded. Both dorsal and ventral bristles showed a granular condition of the axis, so that it (axis) appeared to have minute transverse bars in the centre (Pl. VI. fig. 6).

In the third, fourth, and fifth feet the dorsal lamella largely increases in size as a broadly lanceolate process, but in the third and fourth it is considerably less than the elongate branchia which forms a conspicuous process on the inner side of each, and readily distinguished by the transverse lines. These branchiæ are much longer than those in the Canadian form, and the tip differs in its tapered condition. They are also proportionally larger and longer than in the *P. plumosa* of Sars. The first ten segments are conspicuously bristled, the strongly curved dorsal and ventral bristles projecting laterally in front of the lamellæ. The eleventh has more slender capillary bristles. Claparède stated that the hooks commenced on the fifteenth segment, but Mr. Southern described them on the twelfth bristled segment. When this feature was examined the specimens were much injured, so that exactitude was not possible. They seemed to begin about the fourteenth or fifteenth.

The three forms mentioned above, viz., Malmgren's, Sars's,

and Claparède's, have each distinctive features, yet some of these may be due to imperfections in observation and to variation. Certainly the bristles and hooks are very similar. The occurrence of mature females in Claparède's small form, also recently procured by Mr. Southern, may be connected with racial distinctions. Moreover, the inconspicuous cephalic ridge and the presence of eyes in it, and their absence in Malmgren's form, is another source of dubiety. The Canadian, the Arctic examples procured by the 'Valorous,' and the *P. plumosa* of Sars all present such a ridge, and it is possible Malmgren may have overlooked it, since in some it is inconspicuous.

### (3) *On the British Amphictenidæ.*

The British Amphictenidæ comprised but two species in Dr. Johnston's 'Catalogue of Worms in the British Museum,' viz. *Pectinaria belgica*, Pallas, and *P. granulata*, L. = *Amphictene auricoma*, O. F. Müller. The latter species and *Lagis koreni*, Malmgren, again, were the only forms entered in the 'Fauna of Plymouth' (1904), but Mr. Crawshaw in 1912 added a third, viz., *Petta pusilla*, Malmgren. Two species occur in Mr. Southern's 'Annelids of Dublin Bay,' viz., those mentioned by Dr. Johnston.

The first species is *Pectinaria belgica*, Pallas, from various parts of the English, Scotch, and Irish coasts.

The crown in this species has ten to fourteen paleolæ, which are broader than those of *Lagis koreni*, and, as *P. belgica* is often larger, they are stronger and more individualized, but their curves are similar, the convexity being ventral. They dilate a little above the base, and then taper to a very delicate hair-like tip, which, from the lines at its sides, would seem to indicate relationship with a winged bristle. Friction, however, removes the delicate extremity in some. The outer paleola is shorter than the adjoining one, whilst the two inner appear also to be smaller in most examples. In the largest example from British waters in my collection, viz. from Loch Linnhe, fourteen paleolæ occurred on the left and ten on the right. Above the paleolæ is the tough, firm, and slightly corrugated surface of the crown, which has a proportionally broader rim than in *L. koreni*. Having reached its greatest diameter laterally, it curves ventrally a little within the edge of the paleolæ, and ends at the long anterior cirrus. The margin dorsally and laterally is smooth, but on the ventral curve to the paleolæ it has one or two small papillæ.

After the cirrus the edge slopes backward to form the pillars at the sides of the mouth.

The veil is more restricted than in any of the allied forms, and its outline is fan-shaped, the anterior edge having ten or eleven rather large tapered papillæ or fimbriæ, the edges a few others as they pass to the anterior region of the mouth.

The tentacles arise on each side immediately behind the veil, and form a considerable lateral group on each side. They have the usual shape, and the extremities in the preparations, as in life, are often clavate. Numerous smaller forms occur posteriorly, and all are attached to a surface continuous with and forming part of the veil, and thus are in front of the mouth dorsally. The small lateral fold of the veil to a certain extent forms a guard antero-laterally. A broad fillet occurs on each side of the mouth posteriorly, and a median fold completes it behind.

The second cirrus arises laterally a little behind the margin of the crown, and is a long subulate tapering organ. A ridge passes ventrally from it on each side, meeting its fellow in the middle line behind the mouth, and may be taken to represent a segment. The next two are branchial segments, each having the typical branchia of the group, viz. a series of flat lamellæ largest internally and diminishing externally, attached to the basal and posterior stem. The second is smaller, but of similar structure. These two segments are glandular ventrally, and in the centre of each is a median fold or boss.

The next region of the body, which is smoothly rounded dorsally, flattened and grooved ventrally, consists of three bristled segments devoid of hooks. The first two are highly glandular ventrally from side to side, and with the median fold, whilst the third is apparently only partly so, being continued ventrally as a transversely folded band with a slight median differentiation. The bristles in these are typical, viz., strong bristles with tapering tips, which show traces of wings, and those with the spear-head dilatation and the long hair-like tips, the edge being serrated.

The succeeding region of the body still remains smoothly rounded dorsally, but ventrally it has throughout the five or six anterior segments a fusiform area in the centre—apparently a special glandular region. At each side ventrally in a line with the lamellæ is a short glandular patch, which diminishes as the segments go backward. The ventral surface generally is flattened and grooved posteriorly. This region has fourteen pairs of dorsal bristle-bundles attached to the dorsal edges of the lamellæ bearing the rows of hooks.

The bristle-tufts have stout simple forms with tapering tips, which have traces of wings, besides those with spear-shaped dilatations, serrated edges, and long tapering tips. The tufts are smaller posteriorly, but do not differ in structure.

Each of the hooks presents seven teeth below the crown, then follows a process with minute teeth, the trend of which is from above obliquely outward, whilst its prow inferiorly is bluntly conical. The shaft of the hook is short.

The caudal process is tortoise-shaped, and usually bent at more than a right angle to the dorsum, thus making a small angle with the ventral surface. The rudimentary feet pass obliquely upward to the dorsal keel, toward the end of which is, on each side, a considerable row of caudal hooks. The dorsal surface of the process is flatter than in allied forms, a median keel and symmetrically arranged transverse ridges being on this surface. The rim is not much elevated, and has two notches beyond the hooks, and in some a minute papilla or two. The caudal hooks differ from those of any other form, having a comparatively straight shaft, which tapers toward the neck, then the neck bends a little backward and gently forward at the tip so as to form a strong point. As in other forms, the shaft is longitudinally striated.

The tube is large, nearly straight, and tapered to a small extremity. Moreover, it is lined in some by a comparatively thick internal membrane, which readily separates from the firm wall in the preparations. Its masonry, as a rule, differs from that of *Lagis* or *Amphictene* in so far as the grains are smaller, and, even though in some the surface is rendered irregular by projecting larger grains, the general effect is characteristic. Typical examples on sandy ground are smooth and finely grained, no separate joints being distinguishable.

The second form is *Amphictene auricoma*, O. F. Müller, which is generally distributed all round the British coasts on sandy ground. The crown in this species bears from eleven to thirteen paleolæ, which, in well-preserved examples, are so brittle that few can be removed entire. They are flattened golden bristles, which are a little narrowed at the base, remain of uniform diameter for some distance, and then taper to a fine point, which is either slightly curved or boldly bent round like a hook, thus differing, for instance, from those of *Lagis koreni*, which are coiled after the manner of a watch-spring. The dorsal collar at the margin of the flattened scabrous area above the paleolæ is cut into

rather long fimbriæ, with a broad base and a tapered tip, the latter, however, not being acute; and the collar runs ventrolaterally almost to the base of the anterior cirrus or tentacle, after the manner of *Lagis koreni*. The cirrus is of average length, and is tapered from base to apex. From its base a ridge passes obliquely backward and inward on each side to the mouth. The great length of the rim of the dorsal scabrous plate circumscribes the area of the veil, which is the smallest yet observed; but its disposition is similar, for it has a slight ventral fold on each side to aid in guarding the tentacles. The anterior or free edge is fringed with comparatively long subulate fimbriæ. The tentacles are perhaps less numerous than in allied forms, but their structure is the same, the distal ends being often flattened and with a median groove joining that proceeding along the column.

The folds at the sides of and behind the mouth in the main agree with those of other species.

The second cirrus or tentacle arises on the dorsal edge of a glandular ridge, which ventralwards presents two divisions, viz. an outer transversely elongated rounded eminence, and a larger inner ridge which passes with slight obliquity to a median division. In front of this prominent ridge are two or three minor ones, the grooves of which converge toward the mouth. From the dorsal edge of the cirrus a small ridge runs dorsally, but soon disappears behind the fimbriated rim of the scabrous region.

The branchiæ occupy a similar position to those of *Lagis koreni*, but are specially modified, in so far as the lamellæ of the first branchia are proportionally larger—both broader and longer—and the basal axis to which they are attached is shorter. Thus, the apparatus is more fan-shaped and less like the scorpioidal cyme. As in *Lagis*, the larger lamellæ are internal, and they gradually diminish to the small external end. The second branchia is considerably less in all its parts, but it has the same abbreviation of the basal axis or stem.

The first branchia would appear to belong to the segment behind the second long cirrus, which sends a prominent glandular ridge to the mid-ventral line. The second pertains to the ridge immediately behind, which also passes to the mid-ventral line, where, as in the previous form, a separate shield occurs. It is further distinguished by a considerable flattened glandular lobe which immediately follows the branchia, and which would apparently act as a guard to the first branchia.

So far as these parts show, three segments would thus seem to pertain to the collar-region, viz. that of the second long cirrus and the two branchial segments.

The next region of the body consists of three bristled segments, devoid of hooks as in allied forms. The appearance of these, however, suggests a subdivision, for the two anterior have the thick glandular ridges, the first with a single central division and the second with two central divisions; whereas the third has only a long, slender, non-glandular ridge, as in those which follow. This region appears to be, on the whole, considerably foreshortened in contrast with *Lagis*. The first two tufts are very small, and they arise from the non-glandular or dorsal part of the ridge. The third is considerably larger, and is usually closely applied to the surface of the dorso-lateral region. Each tuft has the stout, tapering, simple bristles with traces of wings distally below the tapered point, and all have, in addition, a few in which the spear-like dilatation at the tip is present, with its tapering hair-like point and serrated edge. All these bristles have a peculiar ring-like dilatation at the base.

The third region is characterised by the great development of the lateral lamellæ for the hooks, as well as for the long and powerful bristles at the dorsal edge. All the latter are very powerful anteriorly, dilating from the base upward until full diameter is attained, and then tapering to a delicate hair-like tip. Besides these are the bristles with the spear-shaped enlargement and the finely tapered tips, the shafts being also robust. The posterior bristles are considerably smaller, but they keep to the same type, those with the spear-shaped tips being proportionally longer.

The caudal hooks are situated on each side of a small keel (notched at its free end), which marks the median dorsal region of the caudal appendage. They are distinguished by their comparatively great length and straightness, by the rapid diminution at the neck, and by the abrupt curve and sharp condition of the hook at the tip. The edge of the process is deeply and symmetrically notched, usually curved ventrally, and the dorsal lip of the vent is prolonged as a somewhat flattened conical process, with a dorsal papilla on its surface, which curves beyond the split ventral lip. The dorsal surface of the process is concave, forming a deep groove, whilst the ventral is convex and grooved by oblique furrows directed outward and backward. It seems to be easily regenerated, even before the bristled segments necessary to complete the series are formed, and thus some examples are peculiarly short and broad, the tapered posterior



region of the body not yet having been reproduced, whilst the caudal process is fully developed.

The lamellar hooks have six teeth from the crown downward, then a finely spinous process (like a large tooth with serrations), below which is a notch directed upward, and, lastly, the rounded prow, which is nearly in a line with the face of the hook. The shaft of the hook is short and comparatively broad.

The tube is gently curved and finely tapered, especially in the smaller specimens, and composed of fine sand-grains neatly cemented together, the tubes of young forms especially having very minute grains. In the 'Porcupine' Expedition of 1869 empty tubes apparently of this species were formed of transversely arranged and neatly cemented sponge-spicules. In specimens from deep water, 80-130 fathoms, in Hardanger Fjord and off Leavig in Norway the tubes at first formed of fine sand-grains were for some distance afterwards formed of sponge-spicules placed transversely.

In extremities a Nemertean (one of the *Aopla*) will occasionally thrust itself in the mouth of the tube, driving the annelid before it and compressing it in the posterior region of the tube.

The third species, *Lagis koreni*, Malmgren, has often been mistaken for *Pectinaria belgica*. In this generally distributed form the head is provided with a transverse series of fifteen lustrous golden paleolæ on each side. Each is a flattened, hollow, chitinous process tapering to a delicate tip, which is always more or less curved toward the dorsum, the concavity of the curve or coil being minutely crenulate, as if from a thinner tissue on that side. Moreover, the point of those in the middle of the series is continued as a long and delicate process—generally coiled. The outer in each series is short, broad at the base, and with a long tapering tip—not coiled. The paleolæ are finely striated longitudinally, and also marked by transverse lines. The second external paleola has its transverse lines arranged in distinct ringed belts, and not scattered indiscriminately. In viewing the paleolæ of each side as a whole, the distal curve of the outer forms is more marked than that of the inner forms, and the inner are deeply set in the tissues and moved by powerful muscles, whereas the external paleolæ are less deeply implanted. The bases of the paleolæ have a slight obliquity, being directed downward and outward on each side. In transverse section the flattened hollow condition of the paleolæ is apparent. Moreover, they become much thinner

and more flattened toward the base. They are hard, though somewhat brittle, and the edge of the razor is often notched in making the sections.

The dorsal or anterior edge above the paleolæ is smooth, firm, and somewhat hollow, with a marginal rim which forms more than a semicircle externally, and ends in a subulate tentacle ventrally. A notch separates the latter from the veil or frilled membrane to the ventral surface of the paleolæ, and the edges of the muscular membrane bear a series of long papillæ or fimbriæ. This membrane is not attached directly to the ventral edge of the rows of paleolæ, a firm transversely elongated area occurring at their base.

Below and attached to the foregoing veil is a dense series of tentacles on each side of the mouth, which has a dorsal fold in the middle line and a transverse one behind it. In the median line ventrally is a large central boss, and on each side is a fillet continued upward by a ridge to the long lateral cirrus in front of the branchiæ. The cirrus is crenulate, with a broad base which tapers by and by to a long slender process with a slightly bulbous tip. In structure this shows externally the cuticle and hypoderm with fibrillation, whilst internally it has granules of various sizes—probably hypodermic. It may be penetrated by the perivisceral fluid. In life, this and the anterior cirrus or tentacle move a little to and fro, or the tips are coiled and waved.

When withdrawing itself into the tube the two rows of golden bristles slightly and symmetrically overlap, for they can both be separated and approximated, and the firm smooth area adjoining forms a platform, the whole performing the part of an operculum.

The tentacles constitute a dense mass, each marked by a longitudinal groove, the red blood-vessel running in the middle line, the blood now flowing distally and again proximally in the same vessel. They are mobile organs and undergo constant contractions and elongations, the tip being often clavate or spathulate. The grooved surface of the tentacle is minutely tuberculated toward the tip, probably in connection with its functions in building the tube—indeed, such elevations may perform the part of minute suckers. The blood seems to flow to the tip of the organ, which becomes deep red, remains there for a little, and then is sent backward. A single blood-vessel apparently with similar action occurs in the long cirri.

The body is from  $1\frac{1}{2}$  to 2 in. in length, gently tapered to a comparatively broad tail, which has the anal appendix passing off at an angle posteriorly. It is rounded dorsally,

flattened and somewhat grooved ventrally, whilst in series from front to rear are the branchiæ immediately behind the long cirrus, a segment without bristles, and fifteen bristle-tufts, with lamellæ for the hooks from the fourth bristle-tuft backward—or twelve in all.

The general hue of the dorsum is brownish pink, the dorsal blood-vessel and the gills being deep red. The first three body-segments have numerous brown specks (eyes?) on their posterior edges. The tentacles are dull pinkish in mass. The caudal process is slightly yellowish. The intestine shines through the translucent iridescent skin as pale brownish, and a large blood-vessel is attached to it dorsally below the more slender median dorsal trunk. This large trunk appears to end in the deep opaque reddish mass below the median fillet of the second bristled segment. The median dorsal (superficial) trunk commences at the tail, whereas the larger and deeper trunk on the gut appears about the third hook-pad posteriorly, and the blood comes from below. The former contracts from behind forward, squeezing the vessel into a pale thread. The entire skin is minutely reticulated with minute red blood-vessels. On the ventral surface is a lateral trunk on each side, which carries the blood backward, and which appears to form the dorsal. The caudal process has pale papillæ along its sides.

The branchiæ are usually two in number, though occasionally the posterior on one side is absent. The anterior lies immediately behind the long lateral cirrus and has the form of a coiled process placed transversely, to which are attached many membranous leaf-like plates, which gradually diminish in size toward the tip, the whole somewhat resembling the antenna of a lamellicorn beetle or the scorpoid cyme of Forget-me-not or Borage. With the leaflets crowded so thickly, the coiling of the axis and the diminution of the lamellæ at the tip present special advantage for aeration. The second branchia arises from the dorsal edge of the segment-ridge behind the former, and its structure is the same. The organs are firmly attached to the skin, and in softened examples are removed with it. In life the bright red branchiæ are most sensitive organs—now being gently extended so as to expose each lamella separately to the water, and again abruptly contracted into a mass.

Dorsally segmentation is less evident, but on the ventral surface the median and lateral ridges give more definition in this respect. A flat papilla, from which a ridge and groove run to the mouth, lies within the long cirrus behind the veil. Then a forward median fold behind the mouth is

continued laterally to the first branchia. This is followed by another median elevation or boss with a ridge on each side to the second branchia. The parts, however, vary much according to the degree of contraction or extension, the first-mentioned median fold in extension becomes a boss, in front of which a groove with a fillet at each side passes to the mouth. Behind the second branchial ridge is a distinct and longer one on each side of a median elevation, and terminating laterally in the first bristle-papilla. The bristle-tufts are directed upward and backward, commencing with three smaller tufts, the first two of which spring from the outer ends of ventral ridges connected with median elevations, whilst the third has only a lateral lamella. No hooks occur on these anterior feet. The fourth foot presents a large lamella and stronger bristles, and the five or six following have also strong bristles, after which they diminish to the last, which are minute—that is, not half the size of the first tuft. The structure of all these tufts of somewhat brittle bristles is the same, though the anterior and especially the posterior show certain modifications. Each has two kinds of stout bristles, viz. (1) that in which the strong shaft, after widening a little above the base, tapers gradually to a somewhat rigid sharp tip, and (2) a shorter series in which the stout shaft tapers to the commencement of the translucent terminal portion, where a rudimentary double wing appears, and then it dilates into a flattened spear-head tapered to a fine point. The broad flattened tip is marked by fine striæ directed distally. The serrations are large at the base of the terminal region, rapidly become finer, then indistinct, and, finally, leave the delicate hair-like tip smooth. The shafts of all are striated longitudinally, and are also crossed at intervals by transverse bars, which, however, do not affect the outline. In the first tuft of bristles the two kinds are more nearly of equal length, and in the last tuft the tips of the simple forms are more gently tapered as well as often fractured; whilst the great length and tenuity of the tips of the second type cause them almost to equal the length of the stronger. In transverse section these bristles are rounded (not circular).

The hooks have a short horizontal shaft, a gentle curve, six teeth along the front edge in lateral view, then a broader part which, at first sight, looks like a seventh tooth, but which really is a series of more minute teeth, as in the typical *Pectinaria belgica*, then the keel below shows a convexity, a hollow, and a small knob at the edge.

The caudal process recalls the condition in the Opheliidæ just as the head, buccal region, and the first body-region do those of the Hermellidæ. Two segments without bristles follow the last bristle-bundles, and then a constriction, the anal process sharply curving ventrally thereafter. In outline it is *Mysostomum*-shaped, having a convex obliquely striated ventral surface and a concave transversely striated dorsal surface, like a sucker, surrounded by a rim which is notched and papillose, and terminating distally in a differentiated flap ventral to the anus, and another freely movable flap of the same length dorsally. At the origin of the caudal process three or four hooks occur on each side of the median dorsal groove. They have short, stout, striated shafts and acutely curved tips, a few transverse striæ also being present here and there on the shaft, especially at the base. One or two developing forms accompany the former.

In a small variety from Norway (dredged by Canon Norman) the dorsal flap has a distinctly papillose margin, a condition also seen in those from Naples.

The anal funnel is, when the animal is removed from the tube, carried at an angle, usually greater than a right angle, to the caudal region, is rounded ventrally, flattened dorsally, and with a spathulate valve hinged dorsally at the tip. The dorsal edges of the process are somewhat scalloped at the base, one deep fissure being present, and each edge has four small clavate papillæ. The dorsal surface of the organ is often expanded into a wide sucker with an obliquely ridged centre and a free crenated edge. The apparatus would seem to act as a powerful ejector.

The tubes of the Neapolitan examples (*Pectinaria neapolitana*) are remarkable for their coarseness and dark colour, from the number of black sand-grains intermingled with brown, yellow, and white. The sand in the intestines of the specimens is equally dark. The tube, again, of a small variety from Norway, *Lophohelia*-ground, Dröbak, 6-14 fath. (Canon Norman), is formed of comparatively coarse fragments—almost as coarse as those of *Petia pusilla*.

Young examples, apparently of this form, occur frequently in the bottom nets at the end of June and in July in St. Andrews Bay. They occupy little transparent tubes, about 1 mm. in length, nearly straight and tapered posteriorly, both ends being open. This tube is composed solely of secretion, and mimics the adult tube of sand-grains. The posterior end of the tube presents a clear transparent margin, then a granular belt, which is followed by somewhat smaller reticulations than in front. The tube is further

chambered by a series of larger reticulations, which cause it to resemble crocodile leather. An account of this form was given by Dr. Erik Nordenskiöld.

The fourth species, *Petta pusilla*, Malmgren, frequents, as a rule, deep water off the English, Scottish, and Irish coasts. The crown has eleven paleolæ on each side with a pale base, which is expanded at the end; the shaft being flattened, little dilated, and then tapered to a blunt (rounded) point. In developing paleolæ a translucent process passes from the blunt tip. The blunt points of these and the coarser nature of the tube, as compared with *Lagis koreni*, are interesting. The upper area obliquely slopes backward and has a smooth edge without a rim. It extends to the ventral edge of the paleolæ, where it ends at the anterior cirrus, a smooth area occurring below the paleolæ—that is, between them and the veil. This process is clearly a development of the flattened area of the crown, and is independent of the veil. The latter has a high arch and a smooth border, but in two examples the highest point of the arch had three papillæ close to each other, the rest of the margin being quite smooth. The veil is of moderate breadth, is attached to the roof of the oral region, and gives origin to the tentacles, which form the usual lateral groups and have the typical structure.

From the second cirrus a ridge passes, as in other forms, ventrally on each side. In this species the anterior margin is 4- or 5-dentate, whilst in the centre is a deep hiatus. In small examples the processes are slender tapering papillæ. The branchiæ on the next two segments are typical,

The second region corresponds with that in other forms, viz. has more slender bristles in smaller tufts than the succeeding. Their structure, however, including the posterior series, corresponds with the type common to all. The stout simple bristles are tapered distally and have traces of wings; and the others have a spear-head enlargement at the end of the shaft and a tapering tip, but the enlargement is proportionally broader and the tapered tip shorter than in allied forms. In the posterior region the fourteen pairs of bristle-bundles exhibit a gradation from the anterior to the posterior extremity. Moreover, the region is only a little tapered posteriorly, the termination being comparatively broad. In consequence, the caudal appendix projects little ventrally from the truncated end of the body, the last foot being modified into a rounded flattened lobe projecting beyond the truncated surface and with a subulate cirrus at its extremity. Moreover, the somewhat long row of caudal

hooks is intimately associated with its dorsal edge. No other hook or bristle is connected with it.

The dense rows of hooks are situated on the edge of the prominent lamellæ. Each has a short base or shaft and a well-marked rounded crown, with a smaller and a larger facing beneath, the curve below the latter sloping to a modified tooth with a spinous edge, then a gulf below and a rounded prow, the basal line being slightly sinuous.

The caudal appendix (scapha) presents dorsally an almost evenly truncated edge in a line with the general surface, the margin, however, being minutely crenulate and projecting a little beyond the dorsal surface of the appendix. Then follows the line of caudal hooks which abut at their ventral edge on the rounded and flattened lamella with the cirrus. A notch separates the ventral edge of the lamella from a series of four fimbriæ between it and the vent, the lower edge of which is crenate with a subulate median cirrus. Nilsson\* has recently shown the structure of the eyes of this organ.

The caudal hooks are slightly narrowed at the base of the striated shaft, then dilate, continue for some distance with nearly parallel sides, diminish toward the neck, and end in a slight curvature at the point, which is somewhat blunt, probably from friction.

The tube is slightly curved, and in Malmgren's examples was composed of minute shells, viz. *Rissoa striata* and *Bulla truncata*. Tubes from the coast of Kerry are composed of comparatively large fragments of shells and stones and a minute *Rissoa*. Those from 422 fathoms off Ireland in the 'Porcupine' Expedition of 1869 were formed of proportionally large translucent grains of quartz with here and there a yellow and black grain of other material. One fragment is composed of Foraminifera with a few grains of sand, but its identity is uncertain. A tube from 567 fathoms in the Atlantic, in the 'Porcupine' Expedition of 1870, presents a uniform series of dull yellow grains throughout. The rounded and comparatively large yellow stones forming a tube from a depth of  $52\frac{1}{2}$  fathoms (log 33) off the south-west of Ireland are noteworthy.

Mr. Crawshay thinks Gemmill's record is the first in Britain, but such is not the case.

\* Beiträge Nervensyst. Polych. Zool. Bidrag Uppsala, Bd. i. p. 137 (1912).

4. *On the British Ampharetidæ.*

No example of the Ampharetidæ was entered in Dr. Johnston's Catalogue in 1865; two, viz. *Melinna adriatica*, Marenzeller, and *Amphicteis curvipalea*, Claparède = *A. gunneri*, Sars, appeared in the Plymouth Catalogue in 1904; whilst a single species, *Ampharete grubei*, Malmgren, occurs in Mr. Southern's 'Annelids of Dublin Bay.'

The first species is *Ampharete grubei*, Malmgren, from English, Scotch, and Irish areas, generally in water of some depth (10–100 fathoms), though it occurs between tide-marks on the shores of France. This form reaches nearly an inch in length in spirit, and is slightly tapered anteriorly, the bristled region of fourteen segments being narrowed both anteriorly and posteriorly, and terminating in the narrower uncinigerous region of twelve segments, the caudal extremity having a series of slender filiform cirri. Generally speaking, the segments of the anterior region are narrow, those of the posterior region are wider. The terminal segment is comparatively small, and the filiform tapering cirri, which Malmgren says are twenty in number, seem to surround the vent. The body is somewhat smoothly rounded dorsally, flattened and marked by a median band ventrally.

The cephalic lobe is, as Fauvel describes, more or less pentagonal, the two anterior lines of the pentagon sloping obliquely forward and inward so as to make a blunt cone. At the posterior border of this region is on each side a minute eye, generally indistinct in spirit-preparations.

The buccal segment is narrow and bears inferiorly the buccal tentacles, which Fauvel frequently found in life in the mouth. The tentacles taper from base to apex, which in the preparations is often slightly enlarged. The base of each is smooth, the small papillæ appearing laterally and increasing in length in the slender distal region of the organ, the tip, however, being bare. A typical papilla is a translucent cylindrical process of the hypoderm covered with cuticle, and having microscopic palpocils at the tip, the space between the rows of papillæ being ciliated, whilst the convex dorsal surface has palpocils, and their cavities communicate with the cœlomic space (Fauvel). In structure these papillæ thus differ from those of *Sabellides*, which have the internal axis.

The mouth has, when closed, a puckered margin with



a conical anterior fold, the tentacles with their plate of insertion being drawn inward, the parts in the respective conditions being clearly shown in Fauvel's figures \*. Some preparations thus show an outer and an inner folded collar.

The second segment is short and devoid of processes. The third bears dorsally the fan of flattened paleæ, and with the next segment (Fauvel) the four branchiæ on each side. The paleæ form a more or less horizontal fan with the longer bristles internal, the shorter external. Each of the larger paleæ has a flattened finely striated shaft and a tapered tip with a granular interior and a slender curved tip ending in a fine point, the same minutely granular aspect being present in it as in the region below. The concave edge of the distal curve is crenulated, after the manner of similar structures in the *Amphictenidæ*.

The branchiæ are smooth or slightly crenulate tapering organs of a greenish hue, which arise three in a transverse row on the third segment and the fourth behind the middle one of the row.

The anterior region is distinguished by the ventral glandular belts and by the presence of fourteen setigerous lamellæ and fourteen lamellæ for the hooks. Whilst two or three of the anterior lamellæ for the bristles are smaller, the typical process is somewhat flattened and carries the row of bristles more or less vertically, the longer and stronger bristles being dorsal, the somewhat shorter ventral. Each bristle has a bulb at its origin, then the shaft dilates a little, remains of equal diameter for some distance, then shows a slight curvature at the commencement of the tip, which has wings and tapers to a hair-like point. About eight of the stronger forms are present in each tuft, besides a series apparently of developing forms, the slender tips of which project between the others at the level of the skin. A tendency of the upper tips to bend downward and of the inferior upward is often apparent.

The lamellæ or ridges for the hooks lie ventralwards of the bristles and anteriorly form ridges with an even margin, but by and by a papilla appears at the dorsal edge and forms toward the end of the region a cirrus with a slender tapering extremity, not shown by Fauvel. The anterior hooks differ from the outlines of Fauvel, having a broader body, about six teeth, and a rounded prow of a different curvature from that figured by the French author.

The posterior region has twelve segments and is dis-

\* *Op. cit.* pl. xix. figs. 57 & 58.

tinguished by the absence of bristles and the elongated nature of the lamellæ for the hooks and of the cirrus, as well as by the great antero-posterior diameter of the segments in relation to their transverse. Each bears laterally the slender tapering cirrus, and beneath it the small elongated lamella for the hooks, which are considerably smaller than those in front, but have a similar structure. If anything they are shorter and broader than those of the anterior region, and show five or six teeth and a rounded prow.

The general colour of a Zetlandic example is pale orange anteriorly from the wall of the gut, whilst the posterior region is pale with the brownish line of the intestine. The processes anteriorly are of a pale amber hue.

Fauvel found gregarines in the alimentary canal. This author's account of the external and internal structure of *Ampharete grubei* is both comprehensive and complete.

Prof. Fauvel\* (1901) severely criticises the statements of M. Cosmovici concerning the segmental organs, especially his view that when the nephridia do not carry the reproductive elements externally they do not communicate with the coelom by a ciliated funnel, and that when present the latter does not open into the preceding segment. Fauvel especially quotes his observations on the nephridia of *Ampharete grubei*, in which only two pairs occur, viz., one piercing the anterior thoracic diaphragm, the other behind it. The former is solely excretory, the latter gives passage to the genital products.

A careful account of the tube of this species and its formation is given by Fauvel (1897). It is composed of shell-fragments and secretion, and is placed vertically on the bottom, one half with thinner walls immersed in the sand and one part with thicker walls projecting from the surface.

The next form is *Amphicteis gunneri*, Sars, which ranges to deep water off the British coasts, and in the neighbouring Atlantic goes to 640 fathoms. In this the cephalic region is somewhat shield-shaped dorsally with a rounded boss on each angle anteriorly and a median groove. A prominent fillet of the buccal segment bounds it laterally and, converging to a median dimple, guards it posteriorly. On each side, at the commencement of the posterior slope, is a minute eye, indistinct in most spirit-preparations. A dimple in the fillet opposite the eye-speck increases its range. Posteriorly is the nuchal organ with pigment-specks in front. The buccal

\* Bullet. Sc. France et Belgique, t. xxxvi. p. 167.

segment has an irregular border anteriorly, since, besides the two lateral fillets at the cephalic plate, a narrow rim passes in front of the mouth and a broader behind it, the margin of the lower lip being marked by five crenations, the three median and their four grooves being most distinct. Projecting from the mouth are the buccal tentacles, which are smooth. The second segment is narrower than the foregoing, and has a nearly straight anterior margin dorsally, whilst ventrally it is sinuous, a forward curve in the middle, then a concavity, the lateral border again slightly curving forward. The region containing the foregoing parts forms a blunt cone differentiated from the succeeding, which is wider, though the maximum transverse diameter is four or five segments behind.

The branchiæ are rather massive subulate organs springing from the third, fourth, and the anterior edge of the fifth segment. Each has a short basal region, from which it readily separates, and a tapering distal part ending in a filiform tip. Two are anterior and two posterior. In the smaller examples variation in the origin of the stems exists, the outer anterior being sometimes nearly in a line with the origin of the posterior pair of one side.

Behind the sixth bristled segment the body gradually diminishes to the tail, which terminates in a median anus with a lateral subulate cirrus on each side. The surface is rounded and smooth dorsally, slightly flattened in front ventrally, and marked by transverse glandular ridges, a distinct median groove running from the middle to the tip of the tail. The length of the body varies from 1 to more than 2 inches.

The third segment, from its greater width and prominent anterior border, indicates the commencement of the bristled region. Its dorsal margin is boldly concave forward, whilst its ventral edge is nearly straight, and there is little to separate it ventrally from the succeeding segment. It carries on the prominent lateral region the fan-like paleæ, which are more or less horizontal—that is, the concavity of the fan looks upward, the convexity downward, and the longest bristles are internal and their number is from fourteen to twenty. They are flattened golden bristles, minutely striated longitudinally, the striæ ending in granules distally, whilst the finely tapered tip is translucent. A few transverse bars occur here and there on the shaft, which dilates from the base to the surface of the skin, and then gradually tapers to the attenuate tip.

The anterior region has seventeen pairs of dorsal bristles,

the first two of which are small, but the rest are conspicuous tufts projecting from setigerous processes, which when viewed from above downward are nearly cylindrical, and when seen antero-posteriorly are slightly tapered distally, and have at the ventral edge of the bristle-tuft a clavate papilla which seems to have escaped Malmgren. This clavate papilla is less developed in front than in the posterior setigerous processes, where it is much larger distally. The bristles have straight striated shafts which dilate a little from the base upward, continue of nearly equal diameter to the commencement of the wings, and then curve slightly backward and taper to a fine tip. The striæ of the shaft become oblique in the curved terminal region, and the wings themselves are striated for some distance upward. These bristles are evidently much used by the annelid, and the basal striated portion of the wings is often worn. A transverse ridge with a small dorsal cirrus curved downward represents the dorsal division behind the foregoing and to the tip of the tail.

The lamellæ for hooks commence on the ventral surface of the seventh segment at some distance from the setigerous process, and at the posterior edge of the segment, wider anteriorly and gradually diminishing. A more or less distinct ridge posteriorly connects them with the setigerous processes. The first are small and little elevated, but they increase in prominence, and gradually approach the setigerous process, so that at the twelfth or thirteenth bristle-bundle they are close to it, and the last is nearly as prominent. Thereafter the uncinigerous processes form conspicuous lamellæ on each side of the posterior region to the tail. The uncinigerous lamella has in the preparations a slightly irregular or crenulated edge, to which the hooks are attached, and a small lanceolate process at the dorsal edge. The hooks have six prominent teeth, the distal region being tapered toward the crown and the dorsal or posterior outline has a marked incurvation above the base, whilst a deep bay occurs below the lower tooth, and then a curved prow. In the largest example (over 2 inches) from deep water, the hooks remained true to the type, five large upper teeth being followed by a smaller process above the prow. De St. Joseph mentions seven teeth on the anterior hooks and six on the posterior; the anterior rows are convex forward, but the posterior are nearly straight.

After the bristles cease a small papilla indicates the site of the setigerous process, and the papilla by and by projects posteriorly from a fused lamella which has a dorsal and a

ventral ridge, the latter being a modification of the connecting-ridge. The uncinigerous lamella is bi-auriculate, and remains so to the end. The last four or five feet, however, are modified, so that only the bi-auriculate uncinigerous process remains.

The posterior border of the caudal segment is either arcuate or smooth, according to the condition as regards reproduction. In those recently reproduced or in process of reproduction, it is arcuate, but in entire examples it appears to be smooth. The cirri are lateral in position and of considerable size.

The tube is composed of mud with a lining of secretion, and has various fragments of shells, spines of *Spatangus*, sand, and minute pebbles adherent or mixed with the mud. The inner secretion, when first exuded, and before being coated with mud and débris, is very tough. The large example from 640 fathoms had its tube thickly coated with mud only. In the Irish example (S.W. Ireland, 1835) the fragments of shells are imbedded transversely in the thick muddy coating of the tube, giving it a heavy and dense character. The tube is placed vertically in its native site.

An excellent description of this form is given by Fauvel (1897) both in regard to external and internal structure.

The *Amphiteis curvipalea* of Claparède\*, a form subsequently procured on the shores of France by De St. Joseph and at Plymouth by Allen†, is, so far as can be made out from the descriptions and an example from Plymouth kindly sent for examination by Dr. Allen, an average specimen of *Amphiteis gunneri*, and Fauvel had formerly come to the same conclusion.

The third species is *Sabellides octocirrata*, Sars, procured off the Hebrides and Ireland.

The Hebridean example is small and presents anteriorly a bluntly conical snout, from which the tentacles have been removed, but in the Irish specimen they are provided with long and proportionally thick papillæ or "cilia," which, however, are devoid of a central axis. The tip in the preparation has a "hairy" aspect, as if from numerous palpocils. Moreover, the papillæ extend nearly to the extremity, only a short granular portion projecting beyond them. The size of these papillæ seems to be a feature of the species.

\* Annél. Nap. Suppl. p. 132, pl. xiii. fig. 5.

† Journ. M. B. A. N. S. vol. viii. p. 230.

From the dorsal surface of the third segment eight somewhat stiff branchiæ project forward. They are proportionally larger than in *Sabellides borealis* and more finely tapered.

The body is small and slender, a little more than half an inch in length, scarcely tapered anteriorly, with the exception of the short cone of the snout, and very gently tapered posteriorly till near the tip, when more rapid diminution occurs to the vent, on each side of which is a slender cirrus.

So far as can be observed, fourteen bristled segments occur anteriorly, distinguished by the absence of the long cirrus which occurs in the sixteen posterior segments. The bristles are short and translucent, with slightly curved, winged, and tapering tips, and they are borne on a prominent setigerous process.

The anterior hooks have a rounded crown, the curve smoothly running into the convex dorsal (or posterior) outline, and the four teeth are characteristic, that next the crown being the largest and the second, third, and fourth regularly diminishing. The prow curves rather far forward and the tip is somewhat small.

The posterior hooks are prominently situated on the edge of the fillet, and are free distally, a space separating the one from the other. They are very minute, and differ from the anterior in the sinuous curve of the crown and the slightly broader prow. They have, however, only four teeth, as in front. The hooks in the var. *mediterranea*, of De St. Joseph, unfortunately, are so indistinct in the figure that little can be said about them, except that they have four teeth in lateral view, a single row occurring in the thoracic forms and a treble row in the abdominal.

The tube is a slender one to suit the small size of the species, and coated with mud and lined by secretion.

The fourth form is *Samytha seacirrata*, Sars, chiefly from Zetlandic waters. In this the head (prostomium) forms a somewhat broad anterior central process with a peristomial buttress on each side. Beneath is the flap bearing ventrally the buccal tentacles, which are smooth and somewhat enlarged distally. The posterior lip is prominent, and passes upward at each side as a process separated from the cephalic border by a notch. When viewed laterally, it forms a projecting spout-shaped frill. The segment behind the buccal has no processes. The third and fourth segments carry dorsally the branchiæ, which are three on each side and comparatively long tapering (subulate) organs. In the

Canadian forms they are nearly half the length of the body in the preparations.

Body somewhat clavate in outline, though a slight narrowing occurs anteriorly from the eighth foot forward, and behind this it diminishes to the tail, which in one presented a thick short cirrus on one side. The dorsum is smoothly rounded throughout, whilst the ventral surface is marked from the mouth to the tenth bristled segment by a thickened glandular layer in each segment. Then a groove appears in the middle line, and is continued to the tip of the tail. In a large example the vent presented a notch dorsally and a crenate edge beneath, and in a perfect Canadian example in a tube a short cirrus occurred on each side. Malmgren's specimens had been imperfect.

External to the branchiæ is the small first setigerous process, which bears a tuft of bristles. This and the next two are rather dorsal than lateral, but they soon become lateral and project from the region as long processes sloping outward and backward.

Each bristle-tuft has a longer and a shorter series of translucent bristles, with a slightly curved tip furnished with somewhat narrow wings. The shaft is minutely striated longitudinally, and widens a little as it approaches the tip.

The hooks have a somewhat triangular outline from the breadth of the crown, which is slightly sinuous. The posterior outline curves to the rounded prow, which is carried to the line of the teeth. The first tooth is as large as the second, and the two following are similar, the last being slightly broader at the base from the curve of the gulf between it and the prow. The posterior hooks are smaller, but they have the same form and structure. Moreover, the papillæ or lamellæ on which they occur are the only processes posteriorly, and are twelve or thirteen in number.

The tube is not mentioned by Malmgren, but is composed of a lining of tough secretion with a few sand-grains and free sheds of mucus, which give it the aspect of being coated with minute algæ.

The fifth representative is *Amage auricula*, Malmgren, procured only in deep water by the 'Knight Errant.' It is a small form about  $\frac{3}{8}$  of an inch in length with a somewhat broad and blunt anterior end, the brachiæ in the preparation being on the anterior ridge, the prostomium being doubled downward as a small and somewhat bifid process, the fillets of the peristomium (Fauvel's rudimentary palps) supporting it laterally and posteriorly. The mouth

has a semicircular posterior lip, from which a median process goes forward to the under surface of the bifid prostomium. No tentacles are visible. In the preparation only three branchiæ are present on each side, but probably the fourth has fallen off. They are somewhat thick tapering processes arising from the third segment.

The anterior hooks commence on the fourth segment, have a sinuous crown, an anterior border with five teeth, the first being smaller than the second, and the third and fourth larger than the second, and the fifth is stouter than the others and separated by a gulf from the rounded prow. The posterior hooks are considerably smaller, but they seem to have the same structure. The bristles are simple with tapering, slightly curved, and winged tips.

As in Malmgren's figure, eight segments occur behind the bristled region, but in the present example two thick short cirri occurred at the tip, and they seemed to be larger than the dorsal cirri in front of them and less clavate in outline than the dorsal cirri; for, when viewed from above, the dorsal cirri are clavate, with a narrow base and rounded or bluntly ovoid tip. The last setigerous process is followed by a short dorsal cirrus, the succeeding cirri having a more elongated stalk and a more distinctly enlarged tip. The ventral uncinigerous processes are bluntly conical papillæ, a considerable ridge intervening between them and the dorsal cirri.

The sixth is *Melinna cristata*, Sars, from the stomachs of cod in St. Andrews Bay, the Forth, and other points on the east coast. The head varies in aspect according to the condition of the tentacles. In contraction, when these are withdrawn within the mouth, the anterior end presents dorsally a short bluntly rounded process with, in some, a notch in the centre. In extrusion of the tentacles there is a flattened lamella, from the anterior edge of which the somewhat clavate tentacles project. The tentacular lobe is separated by a deep dorsal groove from the next segment, the groove passing laterally downward to the mouth in front of the posterior lip. The branchiæ arise from the third segment as two basal processes, each of which soon splits into two anterior and two posterior rather long tapering organs, the largest being the inner of the anterior pair on each side, the two outer being considerably less than the inner posterior. The posterior lip forms a lamella, with a free anterior edge, which curves upward on each side to form a prominent collar at the angle (thus differing from



*M. elisabethæ*), then turns backward to the edge of the denticulated membrane of the fourth setigerous segment. The latter, the lower lip, and the lateral folds thus form a kind of base or sheath for all the parts in front. The transverse and free fold just alluded to has about a dozen denticulations of nearly equal size on its free or anterior edge.

The body is somewhat clavate, broad at the branchial region, and gently tapering to the slender posterior extremity, which is characterised amongst the Ampharetidæ by its great length, no less than about fifty segments occurring in it. The anus is terminal, comparatively large for the size of the region, and in the only example in which the part is apparently complete a few short papillæ occurred on the edge. Above and beneath the anus is a vertical slit with the lateral edge projecting on each side. The dorsal surface of the body is rounded and smooth, whilst the ventral surface is marked anteriorly, as far as the fourteenth bristle-bundle, by the glandular thickenings in each segment; thereafter a median groove is continued to the slender region near the tip of the tail.

The first three bristle-bundles are small, and form a slightly oblique row in the preparations along the edge of the flap between the mouth and the denticulated border on the dorsum of the fourth bristled segment; these have no evident setigerous process, since they are immersed in the tissues of the region. The following fifteen pairs have, when fully developed, a prominent and somewhat conical setigerous process, from which the long pale golden bristles project either transversely or in a slightly backward direction. The bristles have long finely striated shafts and slightly curved and winged tips, which taper to a fine point. A shorter series occurs amongst the foregoing, their finely tapered tips falling short of the longer by a considerable interval.

Between the basal region of the branchiæ on each side and the denticulated margin of the dorsal collar is a powerful hook which, in the preparations, is generally conspicuous, the point being directed backward and downward. It has a broad flattened base and shaft, the latter widening as it proceeds upward from the base to about half its length, then narrows distally, the tip forming a sharp hook which curves to the front. Along the dorsal or convex edge of the curve a considerable thickening of the brittle chitinous tissue occurs, and this part is perforated by a canal containing granular contents, and in connection with a gland, also granular, at the side of the shaft. The canal opens on the convex side of the organ a little short of the tip. The

shaft is finely striated longitudinally, the striæ converging as the hook narrows distally and ceasing within the tip.

The ordinary hooks are arranged on small ridges beneath the bristle-tufts anteriorly from the fourth segment backward. The lamellæ which carry the hooks are at first small, but by and by they project as small flaps with a tendency to a prolongation ventrally. The hooks present a rounded crown with four teeth on the front edge, increasing in size from the first to the third, the fourth having a broad base, but a shorter fang, since the gulf above the rounded prow is small. The posterior margin is sinuous and the base rounded. Behind the bristled region the lamellæ become more prominent, and have a small papilla dorsally.

The tube is coated with greyish mud and lined with tough secretion. Attached externally in Norwegian examples are fragments of shells, it may be in considerable number, and occasionally globular arenaceous Foraminifera with grains of sand in mud, and here and there the leaf of an alga.

The seventh species is *Melinna elisabethæ*, M'Intosh. The specimens of this species were first obtained in Britain by my mother in the stomachs of haddocks, and consequently the external configuration was altered. The presence of the same form in Norwegian waters (dredged by Dr. Merle Norman) enables a more satisfactory description to be made.

The head and anterior region, while formed on the general plan of *M. cristata*, have proportionally longer branchiæ and tentacles. The cephalic border anteriorly has a slight notch and two lateral eminences, and the tentacular plate and the tentacles are often pushed beyond it. The tentacles are remarkably long, and the mouth forms a gaping aperture beneath them at the end of the bluntly conical region.

The branchiæ arise from two basal processes, where they are fused, and they are longer and more distinctly tapered than in *M. cristata*. Moreover, they do not lend themselves to a transverse division into an anterior and a posterior pair as in *M. cristata*. The outer and more slender branchia separates readily to the base, and the next to it posteriorly nearly as far, but the two inner (the one in front of the other) are united for a considerable distance above the base. Their arrangement, therefore, differs from that in *M. cristata*. The dorsal collar stretches in the same manner as in the latter, but the free edges of the two differ, for, instead of the very large, regular, conical processes of *M. cristata*, this form has smaller conical processes, often in groups of three,

and there is less regularity. The edge of the collar thus differs under a lens, and the collar is often shorter from side to side. In front of the denticulated collar a distinct conical process passes forward to the space between the branchiæ. On the ventral surface, again, the body-collar has not the prominent lateral edges seen in *M. cristata*.

The post-branchial hooks are diagnostic, and their position is the same as in *M. cristata*. They have a broad, almost ovoid, flattened shaft, the base of which is often oblique. Anteriorly it somewhat abruptly narrows, and is boldly curved forward as a rounded, tapering, apparently solid hook with a sharp point. The broad shaft is marked by fine longitudinal lines, which are continued beyond the curve and toward the tip of the hook, and also marked by slightly curved cross-striæ which pass forward to the curve or neck of the hook and then cease, the tip being homogeneous and clear. It is moved by powerful muscles attached to the shaft. The concavity of the hook has a thick layer of chitin, but no canal could be made out. Such a hook differs from that of *Melinna cristata* in outline and structure, as well as in the absence of the canal at the tip.

The bristles have the same structure as in *M. cristata*, viz. translucent, striated shafts, and winged tapering tips, and they are accompanied by the shorter series as in the previous form. The hooks resemble those of the other species, but, whilst in *M. cristata* they often show five teeth, in *M. elisabethæ* four is the usual number, and the curves slightly differ.

The tube of this form consists of tough secretion coated with a little mud, and having fragments of shell attached here and there by the edges. The gastric juice of the fishes does not seem to affect the tubes much, though their inhabitants are rapidly softened. The tubes of the Norwegian examples are of tough secretion coated with fine mud, with here and there an arenaceous Foraminifer.

It is curious that this species has never been tossed on shore at St. Andrews. It probably inhabits the deeper water, and is the common form in Norway.

Grube describes *Melinna palmata* from St. Malo, where he obtained a single specimen, as having a smooth (entire) margin to the dorsal collar on the fourth bristled segment, instead of the fimbriated margin of *M. cristata* and *M. elisabethæ*. There are eight branchiæ, which differ at their base from those of *M. cristata*, and in the spirit-preparation the anterior and the inner filaments of the posterior branchia are longer and more pointed than the rest. The frontal

border is three-lobed, as in *M. elisabethæ*. The hooks have four teeth. No mention is made of the two dorsal post-branchial hooks, and though Fauvel subsequently alludes to them as the homologues of the paleæ and transformed dorsal bristles, there is nothing distinctive in either figure or description. The forms appear to differ.

The eighth species is *Melinna adriatica*, Marenzeller, a southern form from Plymouth (Dr. Allen) and Torquay (Major Elwes). In general aspect this form approaches *Melinna cristata*, though it differs in the appearance of the branchiæ and the obscurity of the branchial hooks.

The snout bears a series of smooth tentacles, twelve in number, the shorter forms being inferior. They occur on the dorsal base of a funnel-shaped process, apparently the homologue of the cephalic plate of the Terebellids, which leads to the mouth. In his account of the species, Marenzeller mentions only four tentacles, but they are easily removed in preparations. The shape of the anterior region of the body agrees with that of the typical forms, three bristle-tufts being borne by the oblique anterior part. The ventral collar behind the snout is prominent and smooth, the angle in front of the first bristle-bundle being conspicuous in a ventral view. Posteriorly the body terminates in an anus with a somewhat dilated rim.

The branchiæ resemble in general aspect those of *M. cristata*, though distinguished by their transverse bars and arrangement, since the four branchiæ on each side arise from a curved base, and are all visible from the rear. The branchial hooks are minute and readily escape detection, and thus are in contrast with the two forms most abundant in the north. The shaft is broad and short, striated, and the sharp hook at the tip leaves the neck at more than a right angle, the whole being similar to that of *Melinna maculata*, Webster, which approaches Marenzeller's form.

Behind the foregoing region, at the fourth bristled segment, is the dorsal collar, which is somewhat narrower and less distinctly denticulated than in the two forms previously mentioned, the papillæ having a tendency to fuse with each other, and thus lose the feature so characteristic of *M. cristata*. There are usually four to eight rounded fimbriæ.

The tip of the foot is more distinctly differentiated than in *M. cristata*, as a bluntly conical process marked off from the rest of the foot by a shoulder. Moreover, the bristles are proportionally larger and more deeply tinted yellow by transmitted light. The longer forms have nearly straight shafts and finely tapered tips with just a trace of a bend,

and with distinct but narrow wings, whereas the shorter bristles have boldly curved tips, which, in some, are much worn. The wings of these commence a little beyond the cuticle. The number of the setigerous processes is the same as in the other forms, viz., eighteen, the first three being immersed in the tissues, only the tips appearing beyond the surface.

The anterior hooks, which are in a single row, follow a similar arrangement to those of the other species, but have five teeth anteriorly besides a process above the prow, and thus a greater number, as a rule, than in the two previous forms. The posterior outline is inflected, whilst the inferior border of the base, after a slight inflection posteriorly, becomes convex as it approaches the anterior prow. The posterior hooks do not differ materially from the foregoing, except in size. The hooks differ from those of *Melinna maculata*, Webster, in having a process between the prow and the first tooth.

The tube is composed of secretion covered with a layer of mud. It is friable.

The ninth form is *Melinella macduffi*, sp. n., a form approaching *Pista*. The slender body is slightly enlarged anteriorly, and gradually tapers posteriorly to a delicate tail, which terminates in an anus surrounded by about ten long papillæ. The posterior region in the preparations is moniliform. The dorsal surface is smoothly rounded, the ventral flattened anteriorly and grooved posteriorly. The glandular scutes are confined to the mid-ventral region, and appear to be about ten in number. Segments fifty to sixty. Whilst the tentacles readily separate on removing the animal from its tube, the branchiæ generally remain. They form two slightly branched organs, supported on stalks attached to the first segment. The tip is dichotomously divided in some parts, whilst in others it is irregular. Not more than a dozen filaments of all kinds occur in each branchia.

The setigerous processes, which commence on the third segment, are minute and appear to be about eighteen in number. Each bears a small tuft of translucent bristles, with delicately tapered slightly curved tips with narrow wings, and arranged in two series, a longer and a shorter, the shorter, however, being only a little within the tips of the longer.

The rows of hooks commence with the bristles, and in single series. Each hook much resembles that of *Melinna cristata*, having two distinct teeth above the great fang, a somewhat narrow space below it, as the process on the

anterior outline is high, and an excavation exists below it. The posterior outline has a deep dimple, the inferior margin of the base is convex, and the prow rounded. The posterior hooks have the same structure, but are smaller, and the hispid crowns are proportionally large. After the cessation of the bristles the uncinigerous processes become more distinct, and posteriorly they form in front of the tail a conspicuous series of serrations.

The tube is of moderate length, and composed of secretion strengthened by glittering sponge-spicules and minute Foraminifera, so that it forms a somewhat thick rough or hirsute tunnel. They seem to have formed groups. The sponge-spicules constitute a large part of the wall of the tube, and form a very efficient protection. The inner secretion is somewhat tough.

#### EXPLANATION OF THE PLATES\*.

##### PLATE V.

A female lesser rorqual on its right side. It had been dead several weeks.

##### PLATE VI.

*Fig. 1.* Anterior region of *Prionospio*, from the Gulf of St. Lawrence, Canada (dredged by Dr. Whiteaves). The long tentacles, no trace of which occurred in the collection, have been added from Sars. Enlarged under a low power.

*Fig. 2.* First foot of the foregoing. Zeiss, oc. 4, obj. A.

*Fig. 3.* Second foot of the same. Ditto.

*Fig. 4.* Anterior foot with dorsal and ventral lamellæ and, to the right, a branchia. Similarly magnified.

*Fig. 5.* Dorsal bristle, with its marked curvature.  $\times$  oc. 4, obj. D.

*Fig. 6.* Portion of the shaft of another example, presenting the transverse granular bars.  $\times$  oc. 4, obj. D.

*Fig. 7.* Stiff curved bristle guarding the ventral hooks inferiorly in the middle of the body.  $\times$  oc. 4, obj. D.

*Fig. 8.* Ventral hook. Similarly magnified.

XII.—*Notes on Mollusca collected in the North-west Falklands by Mr. Rupert Vallentin, F.L.S., with Descriptions of Six new Species.* By JAMES COSMO MELVILL, M.A., D.Sc., F.L.S., and ROBERT STANDEN, Assistant Keeper, Manchester Museum.

[Plate VII.]

CONSIDERABLY more than twelve years have elapsed since we reported † on a collection of Marine Mollusca found by Mr. Rupert Vallentin, F.L.S., in the East Falklands, mainly in the neighbourhood of Port William and Stanley Harbour, and we had also, previously to this ‡, in 1898, published an

\* I am indebted to the Carnegie Trust for these Plates.

† Journ. of Conch. x. pp. 43-47 (1901).

‡ *Id.* ix. pp. 97-105 (1898).

account of those gathered by Miss Cobb, in Lively Island, which is situated just off the mainland, due south of Choiseul Sound, of the East Falklands.

At the outset, a brief explanation of the configuration of this group may be necessary.

Two large islands, divided by a narrow sound, running N.E. by S.W., are respectively called the West and East Falklands, the latter being the larger, with an area of 3000 square miles as against 2300. It is also considerably broader, while the length of each is almost the same (say, between 80 and 90 miles). Both islands are mountainous: Mount Adam, in the West Falklands, attains 2315 feet in altitude, while in the corresponding island Mount Usborne is slightly lower (say, 2245 feet). This last also contains the majority of the inhabitants, Stanley being the largest—in fact, the only—town. It is not surprising, therefore, that travellers have in the majority of cases been content to visit the East Island alone, and that the equally important westerly neighbour is almost unworked and only partially explored.

We, indeed, understand from Mr. Vallentin that the collections of Mollusca (Marine, Terrestrial, and Fluvatile) made by him in 1910–11, which form the subject of this paper, are the first that have been brought from this locality, and this fact should render the accompanying catalogue of higher interest than usual, even though the majority are well-known species.

Mr. Vallentin has also kindly submitted to us his notes on the geography, climatic conditions, and other details, which it is best to transcribe, unaltered, in his own words, as follows:—

#### NOTES ON THE COLLECTION.

“All these Mollusks were obtained on the north-west side of the West Falklands.

“There are no land-locked harbours like Stanley Harbour, but the coast-line abounds in very numerous inlets of varying length, and there are many islands past which the tides rush with wild fury. In several places, such as *Reef Channel* and *West Point Pass*, the pace is great during the springs, 8–10 miles an hour, and when, coupled with this, a strong wind is blowing, a terrific sea rages. As a natural consequence, animal life is comparatively scarce, only the strongest forms being able to cope with such wild and savage surroundings.

“By far the most sheltered place in this district is *Roy Cove*, where a fair amount of dredging was accomplished.

This cove is located on the north shore of *King George Bay*. It is very secure and narrow, but the water is fairly deep, ranging from 8 fms. at its mouth to 'nil' at its upper extremity, and it measures about a mile and a half in length.

"The bottom varies from fine shingle and sand for about the first three hundred yards, this being scoured by sheltered estuaries, effectually preventing any work being done on the water, so shore-collecting was the main chance and also close examination of many freshwater pools near, especially the large freshwater lake at the head of *Byron Sound*.

"Within tidal limits, by far the best collecting-ground was to the north-east of *Rapid Point, Port Egremont*. Here an eddy or back-water was formed, and, owing to the abundance of large flat shale rocks of varying sizes, some excellent collecting could be done.

"*Carcass Island* is 20 miles N. of *Rapid Point*. We landed there for a few hours one day when outward bound from Stanley, and found a few Mollusks not noticed elsewhere."—*R. V.*

We must express here our indebtedness to Mr. Vallentin for again entrusting to us his Falkland Island molluscan collections to work out, as they have interested us deeply; and we would also thank Messrs. A. J. Jukes-Browne, F.R.S., H. B. Preston, F.Z.S., T. Iredale, and, above all, Mr. Edgar A. Smith, I.S.O., for valuable aid in many ways, most ungrudgingly given.

## Class *GASTEROPODA*.

### Order AMPHINEURA.

#### Suborder POLYPLACOPHORA.

##### *Tonicia atrata* (Sowb.).

*Chiton atratus*, Sowerby, Charlesworth's Mag. Nat. Hist. 1840, p. 294; Conch. Illustr. figs. 57, 58.

*Tonicia atrata* (Sowb.), H. & A. Adams, Gen. Rec. Moll. i. p. 474 (1858); Pilsbry, in Tryon, Man. Conch. xiv. [p. 201, pl. xli. figs 28-30.

Not uncommon in the West Falklands.

##### *Tonicia bennetti*, Iredale, MS.

Rare.

A species with smoothish grey valves. We cannot find that this has yet been described.



*Callochiton illuminatus* (Reeve).*Chiton illuminatus*, Reeve, Conch. Icon. pl. xxii. fig. 147 (1847).*Chiton*-(*Callochiton*) *illuminatus*, Smith, P. Z. S. p. 35 (1881).

This species seems very generally distributed over the area.

*Plaxiphora carmichaelis* (Wood).*Chiton carmichaelis*, Wood, Suppl. Ind. Test. pl. i. fig. 10 (1828);

Gray, Spicil. Zool. pl. i. fig. 6 (1828).

*Chiton setiger*, King, Zool. Journ. v. p. 358 (1832); Sowerby, Conch.

Illustr. p. 17; Zool. Beechey's Voyage, pl. xl. fig. 7.

Not uncommon, but only small examples forwarded.

## Order PROSOBRANCHIATA.

## Suborder DIOTOCARDIA.

## (a) DOCOGLOSSA.

Fam. *Acmaeidæ*.*Acmaea ceciliana*, D'Orb.*Acmaea ceciliana*, D'Orb. Voy. Amér. Mérid. p. 482, tab. lxxxi.

figs. 4-6; Gay, Hist. de Chile, viii. p. 260 (1854); Tryon, Man.

Conch. xiii. p. 33, pl. xxxiv. figs. 14-21.

Var. *magellanica*, Strebel.*Acmaea ceciliana*, var. *magellanica*, H. Strebel, Mollusk. der Magalhaen-Provinz, Zool. Jahrb. xxii. Band, Heft i., Jena (1907).

Dip Creek, Roy Cove, at low tide, and also occasionally at high-water mark. One from the latter locality seems to be of the variety *magellanica*. This is a common mollusk throughout the Falkland group.

*Scurria scurra* (Lesson).*Patella scurra*, Lesson, Voyage de la 'Coquille,' 1826-30.*Scurria scurra* (Gray), Tryon, Man. Conch. xiii. pl. xxxix. figs. 26, 27.

"Roy Cove: found dead on the shore at low water. Port Egremont: very large examples on the south shore after a northerly gale; they were cast up alive, but birds soon extracted the animal."—*R. V.*

These latter are in fine condition, pale brown, very smooth, and irregularly marked longitudinally with zigzag lines, becoming evanescent above the margin. Within, the surface is pure white. This species has a large synonymy, it being the *Acmaea scurra*, D'Orb., *Lottia pallida*, Sowb., *L. conica*, Gould, and *Acmaea cymbula*, Hupé.

## Fam. Patellidæ.

*Patella ænea*, Martyn.*Patella ænea*, Martyn, Univ. Conch. i. fig. 17 (1780).Var. *deaurata*, Gmel.*Patella deaurata*, Gmelin, Syst. Nat. xiii. t. i. p. 3719 (1790); Blainville, Malac. pl. xlix. fig. 7; (Gmelin), E. A. Smith, Zool. Kerguelen Moll., Phil. Trans. Royal Soc. Lond. clxviii. p. 79; Pelseneer, Voy. 'Belgica,' Zool., Moll. p. 7.

## Roy Cove.

All that were forwarded were small specimens, clean and free from nullipore and other growths, consequently characteristically marked and coloured. One example, with noduled ribs, came from "extreme low-water mark," being found there in company with *Yoldia eightsii*, Couth.

*Patella delicatissima*, Streb.*Patinella delicatissima*, H. Strebel, Mollusk. der Magalhaen-Provinz, Zool. Jahrb. xxv. Band, Heft i. (1907); Jena, p. 145, Taf. v. figs. 71-72, 74-75.

## Rapid Point and Roy Cove, at low water.

The surface of this beautiful form is most delicately squamose, the scales imbricating. Within, a resemblance to *P. ænea* is seen, and it is probable, when a larger series of this have been gathered, that intermediates will occur to link the two forms together.

*Nacella mytilina*, Helbling.*Patella mytilina*, Helbling, Abhandl. ein. Privatgesellsch. Böhmen, iv. p. 104, tab. i. figs. 5, 6 (1779); H. Strebel, Mollusk. der Magalhaen-Provinz, p. 113, Taf. iii. fig. 44 (1907).

## Roy Cove, at low water.

This species seems quite distinct from *N. cymbularia*, Lamk., with which it is generally confounded, and is the prevailing *Nacella* in the Falklands.

## (b) RHIPIDOGLOSSA.

## Section ZYGORANCHIATA.

## Fam. Fissurellidæ.

*Fissurella oriens*, Sowb.*Fissurella oriens*, Sowb. P. Z. S. Lond. p. 124 (1834); Thes. Conch., *Fissurella*, p. 186, fig. 19.

Var. *mexicana*, Sowb.

*Fissurella mexicana*, Sowb. Conch. Illustr. fig. 61; Thes. Conch. p. 180, figs. 26-28.

Roy Cove, not adult; King George's Bay.

Examples in good condition were collected miles inland, in camp, evidently dropped by sea-birds after they had devoured the inhabitant. We follow Dr. Hermann Strebel in considering *mexicana* a form of *oriens*. The typical form does not appear.

*Fissurella picta* (Gmel.).

*Patella picta*, Gmelin, p. 3729. sp. 198.

*Fissurella picta*, Sowerby, Conch. Illustr. figs. 4, 26.

On the beach, Roy Cove, at low water, Shallow Bay.

*Fissurella polygona*, Sowb.

*Fissurella polygona*, Sowerby, Thes. Conch. vol. iii. p. 186, fig. 137; Pilsbry, Man. Conch. xiii. p. 148, tab. lx. fig. 84; H. Strebel, Mollusk. der Magalhaen-Provinz, p. 85, Taf. i. figs. 4, 5, 6 (1907).

Roy Cove, low water to 2-4 fathoms; also Rapid Point (March 31st, 1911).

Dr. H. Strebel deems this either synonymous with or a variety of the next (*F. radiosa*, Less.).

*Fissurella radiosa*, Lesson.

*Patella radiosa*, Lesson, Voy. de la 'Coquille,' vol. ii. p. 411 (1826);

Pilsbry, in Tryon, Man. Conch. xiii. p. 157; Melvill & Standen, Journ. of Conch. ix. p. 102 (1898).

Lively Island, East Falklands.

This was also obtained some years ago from the same locality by Miss Cobb in finer condition and variety; and likewise by Mr. R. Vallentin from Port Stanley.

*Puncturella noachina* (L.), Lowe.

*Patella noachina*, Linn. Mant. Plant. p. 551.

*Puncturella noachina*, Lowe, Zool. Journ. iii. p. 78 (1827); Forbes & Hanley, ii. p. 474, pl. lxii. figs. 10-12; Pilsbry, in Tryon, Man. Conch. xii. p. 229.

Var. *falklandiana*, A. Adams.

*Puncturella falklandiana*, Ad., Tryon, l. c. p. 231, tab. lxiii. fig. 33.

*Puncturella noachina*, var. *falklandiana*, H. Strebel, Mollusk. der Magalhaen-Provinz, p. 104 (1907).

Roy Cove, on rocks at low water.

Rapid Point, also at low tide.

The specimens from the former locality more assimilate the type. It is impossible to separate *falklandiana* as a genuine species.

*Megatebennus patagonicus*, Streb.

? *Megatebennus patagonicus*, H. Streb., Mollusk. der Magalhaen-Provinz, Zool. Jahrb. Band xxv., Jena (1907).

Rapid Point, at low water; also Roy Cove. [Several examples.

In a previous paper (Journ. of Conch. x. p. 45, 1901) we mentioned this species under the name of *Fissurellidea hiantula*, Lam. (non Reeve). This was seven years before it was properly differentiated and named by Dr. Streb. It would appear to be the only one of its kindred inhabiting this region.

Section AZYGobranchiata.

Fam. Trochidæ.

*Photinula tæniata* (Wood).

*Trochus tæniatus*, Wood, Index Suppl. pl. v. fig. 12.

*Margarita tæniata*, Reeve, Conch. Icon. xx. fig. 4; Kiener, xi. p. 319, pl. c. fig. 2.

Roy Cove, 2-4 fathoms, on the alga *Macrocystis pyrifera*, Ag.

Var. *cærulescens* (King).

*Margarita cærulescens*, King, Zool. Journ. v. p. 346, fig. 54 (1832);

Sowerby, in Reeve, Conch. Icon. xx. fig. 12.

*Trochus cærulescens*, Philippi, Conch. Cab. p. 250, t. xxxvii. fig. 11.

*Photinula cærulescens*, Ad. Gen. Moll. i. p. 427.

Occasionally, with the type.

*Photinula violacea* (King).

*Margarita violacea*, King, Zool. Journ. v. p. 346 (1832); Sowerby,

Conch. Illustr. figs. 11, 12; in Reeve, Conch. Icon. xx. fig. 5.

*Trochus violaceus*, Philippi, Conch. Cab. p. 254, t. xxxvii. fig. 18.

Also at Roy Cove, with *P. tæniata* (Wood).

Suborder MONOTOCARDIA.

Section (a) PTENOGLOSSA.

Fam. Scalidæ.

*Scala magellanica*, Phil.

*Scalaria magellanica*, Philippi, Archiv für Naturg. 1845, p. 46.

Var. *latecostata*, Streb.

*Scalaria magellanica*, var. *latecostata*, H. Streb. Mollusk. der Magalhaen-Provinz, Zool. Jahrb. Band xxii. Heft 6, Jena, 1905, p. 658, Taf. xxiii. fig. 43 a-d.

Rapid Point; at low-water mark.

This is a very elegant form, and presents a very different appearance from the type, the ribs being, as the specific name implies, broader by far and fewer in number than those of *magellanica*. It seems to us that, unless intermediates be found, it might be considered a true species.

## Section (b) TÆNIOGLOSSA.

## Fam. Naticidæ.

*Natica impervia*, Phil.

*Natica impervia*, Philippi, Archiv für Naturg. i. p. 65 (1845).

Fine examples, alive, with the smooth calcareous operculum attached. They have not been exactly localized, but doubtless occur plentifully in the sandy coves.

*Lamellaria ampla*, Streb.

*Lamellaria ampla*, H. Streb. Mollusk. der Magalhaen-Provinz, Zool. Jahrb. Band xxiv. Jena, 1906, p. 135, Taf. xi. fig. 70 a-c.

A single example, pure white, very fragile, and slightly broken, but characteristic.

## Fam. Calyptræidæ.

*Crepidula dilatata*, Lamk.

*Crepidula dilatata*; Lamarck, Anim. sans Vert. vii. p. 644; Sowerby, Thes. Conch. v. p. 65, figs. 100, 101; Reeve, Conch. Icon. xi. p. 3.

Rapid Point (March 31, 1911).

*Trochita radians* (Lamk.).

*Trochus radians*, Lamarck, Anim. sans Vert. vii. p. 11.

*Calyptræa radians*, Deshayes, Enc. Méth. pl. cxv. fig. 3.

*Calyptræa* (*Infundibulum*) *radians* (Lamarck), Tryon, Man. Conch. viii. p. 121, pl. xxxv. figs. 84-88 (1886).

Shallow Bay, at low water.

The synonymy of this species is very extensive, and is given to some extent in Tryon's 'Manual.' Of the various names employed, *corrugata*, Reeve, is probably the most familiar next to that actually adopted.

## Fam. Littorinidæ.

*Lævilittorina bennetti*, Prest.

*Lævilittorina bennetti*, H. B. Preston, Ann. & Mag. Nat. Hist. ser. 8, vol. ix. p. 636, fig. (1912).

Roy Cove, W. Falklands; at half-tide (March 14, 1910).

We are indebted to the author of the species for confirming the name. It is a very minute shell.

*Lævilittorina caliginosa* (Gould).

*Littorina caliginosa*, Gould, Proc. Boston Soc. iii. p. 83 (1849).

*Hydrobia caliginosa* (Gould), E. A. Smith, Phil. Trans. Royal Soc. Lond. clxviii. p. 173, pl. ix. fig. 8 (1879).

*Lævilittorina caliginosa* (Gould), Pfeffer, Mollusken von Süd Georgien, p. 81, Taf. i. fig. 8 a-d (1886); H. Strebel, Mollusk. der Magalhaen-Provinz, Zool. Jahrb. Band xxv. Jena, 1907, p. 156.

Crooked Inlet; under stones at low water.

*Lævilittorina latior*, Prest.

*Lævilittorina latior*, H. B. Preston, Ann. & Mag. Nat. Hist. ser. 8, vol. ix. p. 636, fig. (1912).

Under stones, easily overlooked. Another very microscopic species.

## Fam. Cerithiidæ.

*Cerithium pullum*, Phil.

*Cerithium pullum*, Philippi, Archiv für Naturg. p. 66 (1845).

*Cerithium cælatum*, Couthouy, Gould, in Wilkes' Expl. Exped. p. 148, fig. 174 a-d; Gould, Boston Proc. iii. p. 123 (1849).

*Bittium cælatum*, Couthouy, Mission du Cap Horn, p. 40.

*Cerithium pullum* (Phil.), H. Strebel, Mollusk. der Magalhaen-Provinz, Zool. Jahrb. Band xxii. p. 652, Taf. xxiii. fig. 40 a-d (1905).

Rapid Point, at low water; also Carcass Island.

Several examples. Evidently a common species, widely distributed.

*Cerithiopsis malvinarum*, M. & St.

*Cerithiopsis malvinarum*, Melvill & Standen, Moll. Scott. Nat. Antarctic Exp., Trans. Royal Soc. Edinb. xlv. p. 135, figs. 6, 6 a (1907); H. Strebel, Wissenschaft. Ergebnisse der Schwedisch. Südpolar-Exped., Die Gastropoden, p. 49, Taf. i. fig. 10 a-c (1908).

Roy Cove; low water, on mud.

One small but quite characteristic example,

*Bittium burdwoodianum*, M. & St.

*Bittium burdwoodianum*, Melvill & Standen, Moll. Scott. Nat. Antaret. Exp., Trans. R. Soc. Edinb. xviii. p. 351, plate, fig. 12 (1912).

Rapid Point ; low water, spring tide.

A small species, with certain Cerithiopsoid characters. Burdwood Bank, from whence the type came, is situate just south of the Falklands, between them and the Antarctic Continent.

## Section (c) GYMNOGLOSSA.

## Fam. Turbonillidæ.

*Turbonilla smithii*, Pfeffer, MS.

*Turbonilla smithii*, Pfeffer, MS., in H. Strebel, Mollusk. der Magalhaen-Provinz, Zool. Jahrb. Band xxii. p. 659, Taf. xxiii. fig. 42 a-d (1907).

King George's Bay.

One specimen is in very fine condition, displaying the nuclear whorls to perfection. They are well figured by Dr. Strebel.

*Odostomia biplicata*, Streb.

*Odostomia biplicata*, H. Strebel, Wissenschaft. Ergebnisse der Schwedisch. Südpolar-Exped., Stockholm, 1908, p. 65, Taf. i. figs. 9, 9 a.

The only example found, of a clear corneous hue, occurred at the roots of the giant alga *Macrocystis pyrifera*, Ag. The double plication on the columella is hardly observable without a lens.

## Section (d) RACHIGLOSSA.

## Fam. Muricidæ.

*Trophon crispus* (Couth.).

*Fusus crispus*, Couthouy, Gould, in Wilkes' Expl. Exped. p. 229, fig. 279 a-c.

*Fusus fimbriatus*, Hupé, Gay, Hist. de Chile, p. 165, pl. iv. fig. 7 ; Smith, 'Alert' Surv., P. Z. S. 1881, tab. iv. fig. 4.

*Fusus crispus*, H. Strebel, Mollusk. der Magalhaen-Provinz, Zool. Jahrb. Band xxi. p. 204, Taf. iii. fig. 10 a-g (1904).

Saunders Island ; in rock-pools, at low water. Rapid Point ; low water. Roy Cove, to 4-6 fathoms.

The close, fimbriate, imbricating scales are seen to advantage in a well-grown specimen from the first locality mentioned. This is more attenuate than usual, 6- to 7-whorled, measuring long. 30, lat. 13 mm.

*Trophon couthouyi*, Streb.

*Trophon couthouyi*, H. Streb., Mollusk. der Magalhaen-Provinz, Zool. Jahrb. Band xxi. p. 236, Taf. vii. fig. 65 a-e, and Taf. vii. fig. 76 (1904).

## Carcass Island and Roy Cove.

In our specimens, referred with some confidence to this species, the inner lip is tinged with pink suffusion.

*Trophon geversianus* (Pallas).

*Buccinum geversianum*, Pallas, Spicil. Zool. fasc. x. p. 33, pl. iii. fig. 1.

*Murex magellanicus*, Gmelin, p. 3548. no. 80.

*Trophon geversianus*, Sowerby, Thes. Conch. part xxxv. p. 59. sp. 1;  
H. Streb., l. c. pp. 173-199, Taf. iv.-vi. figs. 11-52, Taf. viii. figs. 80, 81 (1904).

Rapid Point; also Roy Cove Creek, at low water, and Shallow Bay.

The specimens received by us from the West Falklands are smaller than from the other island, but no doubt it is generally distributed, and finer examples could be procured.

It has been well figured in Journ. of Conch. ix. plate ii.

The synonymy is vast, and for full details we would refer to Trans. Royal Soc. Edinb. xlv. p. 136.

*Trophon laciniatus* (Martyn).

*Buccinum laciniatum* Martyn, Univ. Conch. ii. fig. 42 (1789).

*Trophon laciniatus*, Chemnitz, ed. ii. (Kobelt) fol. 280, figs. 6, 7 (1878).

*Fusus laciniatus*, Reeve, Conch. Icon. v. fig. 14 a-c (1847); Gould, in Wilkes' Expl. Exped. p. 228, pl. xvi. fig. 278 (1853).

With the last at Rapid Point and Roy Cove Creek, at low water. From the latter place a fine example, from the former a smaller shell well exhibiting the smooth, oblique, semi-planate, nuclear whorls.

*Trophon liratus* (Couth.).

*Fusus liratus*, Couthouy, Gould, in Wilkes' Expl. Exped. p. 231, fig. 282 a-c.

## Stanley Harbour.

This is probably *Buccinum cancellaroides*, Reeve.

## Fam. Buccinidæ.

*Prosipho crassicosatus* (Melv. & St.).

*Chrysodomus (Sipho) crassicosatus*, Melvill & Standen, Trans. Royal Soc. Edinb. xlv. p. 138, plate, figs. 10, 10 a (1907).



*Sipho* (*Mohnia*?) *astrolabiensis*, H. Strebel, Wissenschaft. Ergebnisse der Schwedisch. Südpolar-Exped. p. 31, Taf. iii. fig. 37 *a-d* (1908).

*Prosipho astrolabiensis* and *crassicostatus*, Thiele, Deutsche S. Polar. Exped. pp. 206 & 262 (1912).

Rapid Point, Port Egremont, on roots of *Macrocytis*.

We have only seen the figure of *astrolabiensis*, Strebel, but it appears to exactly resemble our species, described one year earlier (1907).

*Euthria* (*Pareuthria*) *cerealis*, Rochb. & Mab.

*Euthria cerealis*, Rochbrune & Mabille, Mission Scientifique du Cap Horn, Gastropoden, pp. 1-100 (1889).

? *Euthria* (*Pareuthria*) *cerealis*, H. Strebel, *l. c.* p. 623, Taf. xxi. figs. 10, 10 *a* (1905).

Rapid Point, Port Egremont, and Roy Cove, all at low-water mark.

A smooth fulvous-grey species, without any specially marked leading characteristics.

*Euthria* (*Pareuthria*) *fuscata* (Brug.).

*Buccinum fuscatum*, Bruguière, Encycl. Méth. vers. p. 282 (1792).

*Buccinum fuscatum antarcticum*, Reeve, Conch. Icon. iii. fig. 30 (1846).

*Euthria antarctica*, E. Lamy, "Gastr." Exp. Charcot, Bull. Mus. Hist. Nat. i. 11, p. 476 (1905).

*Euthria* (*Pareuthria*) *fuscata* (Brug.), H. Strebel, Mollusk. der Magalhaen-Provinz, Zool. Jahrb. xxii. p. 611, pl. xxiv. figs. 69-79 (1905).

Roy Cove, 2-4 fathoms.

We also have received the variety of this species with effuse outer lip, from the N. Falklands, from the late Captain Philip Hamond, who collected it there more than fifty years ago; and it is undoubtedly generally diffused throughout the whole area.

*Euthria* (*Pareuthria*) *magellanica*, Phil.

*Buccinum magellanicum*, Philippi, Abbild. iii. p. 48, tab. i. fig. 14 (1848).

*Fusus rufus*, Homb. & Jacq. Voy. 'Astrolabe,' v. p. 107, tab. xxv. fig. 3 (1854).

Roy Cove, at low water.

*Euthria* (*Pareuthria*) *michaelseni*, Streb.

*Euthria* (*Pareuthria*) *michaelseni*, H. Strebel, Mollusk. der Magalhaen-Provinz, Zool. Jahrb. xxii. p. 621, pl. xxi. figs. 6, 6 *a-b* (1905).

Roy Cove and Rapid Point, at low-water mark.

Quite characteristic examples of this neat species, in which

the chestnut colour, smoothly rounded whorls which are uniformly closely spirally lirate, with a transverse whitish band centrally situate on the body-whorl, and situate just above the sutures on the upper whorls, amply distinguish it from its allies.

*Euthria (Pareuthria) mulachi*, Streb.

*Euthria (Pareuthria) mulachi*, H. Streb. *l. c.* p. 623, Taf. xxi. figs. 8, 8 a (1905).

Rapid Point, at low water.

We have not seen this species, and have identified it through comparison with Streb. 's figure and description, the only difference being that in our shell the columella is decidedly straighter. Within, the mouth shows brownish reflections, the body of the shell being livid grey.

*Euthria (Pareuthria) plumbea* (Phil.).

*Fusus plumbeus*, Philippi, Abbild. i. p. 108, tab. i. fig. 8 (1844).

*Euthria plumbea*, Kobelt, Martini & Chemnitz, fol. ii. p. 228, tab. lxxiii. figs. 8, 9; Tryon, Man. Conch. iii. p. 150, tab. lxxii. fig. 221.

Roy Cove and Rapid Point, at low water.

*Euthria (Glypteuthria) meridionalis*, Sm.

*Euthria meridionalis*, E. A. Smith, Survey 'Alert,' P. Z. S. Lond. p. 29, tab. iv. fig. 6 (1881).

*Euthria (Glypteuthria) meridionalis*, H. Streb. *l. c.* p. 627, Taf. xxi. fig. 11 a-d (1905).

Roy Cove; one somewhat doubtful example.

*Euthria (Glypteuthria) kobelti*, Streb.

*Euthria (Glypteuthria) kobelti*, H. Streb. *Mollusk. der Magalhaen-Provinz*, Zool. Jahrb. xxii. p. 632, Taf. xxi. figs. 15, 15 a (1905).

At root of *Macrocystis*, Rapid Point, Port Egremont.

One example only, hardly adult, but agreeing with figure and description.

*Anomacme smithi*, Streb.

*Anomacme smithi*, H. Streb. *l. c.* p. 633, Taf. xxii. fig. 28 a-e (1905).

Roy Cove, both at low water at spring tide and also dredged 2-4 fathoms.

*Monoceros calcar*, Mart.*Buccinum calcar*, Martyn, Univ. Conch. ii. t. x. fig. 50.*Monoceros imbricatum*, Lamarck. Anim. sans Vert. (Deshayes), x. p. 119.*Monoceros calcar*, id. ibid. x. p. 122.*Monoceros glabratum*, id. ibid. x. p. 120.

King George's Bay ; found living at one spot only on the north shore. The rocks here are very large and piled up under high cliffs.

These mollusks are found in dark crevices of the huge rocks, exposed only for a brief space during low-water springs. Damaged and wave-worn specimens, indeed, are common on shore after gales, but not the finely sculptured forms. Some large purpuroid capsules were found with the shells on the beach just at the N.W. corner of the West Falklands, and most probably belong to this species.

## Fam. Volutidæ.

*Voluta (Cymbiola) ancilla*, Sol. (Pl. VII. fig. 7, juv.)*Voluta ancilla*, Solander, Portland Cat. p. 137. no. 1873 ; Lamarck, Anim. sans Vert. vol. vii. p. 343, and (ed. Deshayes) x. p. 397. sp. 33.*Voluta magellanica*, Sowb. Thes. Conch. i. pt. v. pl. liv. fig. 99.*Voluta ancilla*, H. Streb. l. c. p. 113, Taf. vii., viii., ix., x.

## Whaler Bay.

A large capsule, containing six well-developed embryonic examples of this species, was dredged as above. It measured 50 mm. in diameter, while the young shells are alt.  $12 \times$  lat. 5 mm. M. Rupert Vallentin informs us that he has also dredged similar capsules in Stanley Harbour, but till now they have always been empty.

Dr. Hermann Streb. figures (l. c. Taf. x. fig. 52) a similar capsule of *V. ancilla* containing eight or nine embryos.

## Section (e) TOXOGLOSSA.

## Fam. Conidæ.

*Bela fulvicans*, Streb.

*Bela fulvicans*, H. Streb. l. c. Wissenschaft. Ergebnisse der Schwedisch. Südpolar-Exped. Band vi. Lief. i. p. 15, Taf. ii. fig. 25 a-d (1908) ; Trans. Royal Soc. Edinb. xlviii. p. 356 (1912).

Roy Cove, at low-water mark (January 12, 1910).

One example only, but in good condition, fulvous brown in colour, agreeing very well with figure and description of a species found in 1902-3 by the Swedish South-Polar Expedition in three localities, two being in South Georgia, the

third at Graham's Land, Antarctic Continent. We reported it also among the Mollusca of the Scottish National Antarctic Expedition, from Burdwood Bank, at 56 fathoms.

*Savatieria areolata*, Streb.

*Savatieria areolata*, H. Streb. Mollusk. der Magalhaen-Provinz, Zool. Jahrb. Band xxii. p. 645, Taf. xxi. figs. 19, 19 a-b (1905).

Roy Cove, at low water, rarely.

*Savatieria bertrandi*, sp. n. (Pl. VII. figs. 1, 2.)

*S. testa parva, solidiuscula, olivaceo-brunnea, fusiformi; anfractibus 8, quorum apicales 2-3 læves, simplices, cæteris ad suturas canaliculatis, supernis tribus longitudinaliter rugoso-costulatis, omnibus spiraliter profunde rotundi-sulcatis, anfractu antepenultimo et penultimo tribus, ultimo quatuor sulcis prædito, deinde ad basim infra peripheriam evanidis; apertura parva, intus castanea, labro paullum effuso, sinu absente, canali abbreviata, margine columellari fere recta.*

Alt. 7, lat. 2 mm.

Rapid Point, at low water; West Falklands.

This very interesting species occurred but in small quantity. It is conspicuous for its deep, roundly ridged, spiral sulci, most conspicuous on the three lowest whorls, the next three uppermost being likewise longitudinally roughly costate. No sinus on the outer lip is perceptible. The genus *Donovania* seems nearly allied, at all events by shell-characters. This was found by the late Mr. Martin F. Woodward\* to be buccinoid rather than pleurotomoid, being, as regards its radula, rachiglossate, and, perhaps, nearest to *Pisania*. It may be that *Savatieria* will ultimately find a place near them; but, at present, so far as we can learn, the anatomy of this genus is unknown. Dr. H. Streb. seems to suggest *Lachesis* = *Donovania* as an ally (*l. c.* p. 641).

We have pleasure in associating with this *Savatieria* the name of Mr. Wickham Bertrand, father of Mrs. Rupert Vallentin, who has aided much in molluscan and other research in these islands.

Fam. Cancellariidæ.

*Admete magellanica*, Streb.

*Admete magellanica*, H. Streb. Mollusk. der Magalhaen-Provinz, Zool. Jahrb. Band xxii. p. 594, Taf. xxii. fig. 29 a-d (1905).

Carcass Island.

\* Proc. Malac. Soc. iii. pp. 235-238, figs.

Two perfect examples. The upper whorls especially are beautifully reticulately sculptured.

## Order PULMONIFERA.

### Section INOPERCULATA.

#### Fam. Helicidæ.

##### *Patula michaelsoni*, Streb.

*Patula michaelsoni*, H. Streb., Mollusk. der Magalhaen-Provinz, Zool. Jahrb. Band xxv. p. 160, Taf. viii. fig. 97 (1907).

Near Roy Cove.

On the discovery of this interesting little snail Mr. Vallentin writes, under date 22nd May, 1910:—

“I send herewith what I take to be a rather good find, viz., a terrestrial mollusk. Mrs. Vallentin and I were collecting in the camp some few days ago, and from a clump of damp moss removed from a hillside swamp her sharp eyes detected what at first seemed to be a seed-capsule or fruit of a moss; but examination with a pocket-lens at once showed the real nature of our find, and stimulated closer search. After much hard work we eventually bagged six specimens. The animal is very shy, black in colour, and its foot does not protrude beyond the margin of the shell when crawling.”  
—R. V.

### Section SIPHONARIOIDEA.

#### Fam. Siphonariidæ.

##### *Siphonaria lateralis*, Couth.

*Siphonaria lateralis*, Couthouy, Gould, in Wilkes' Expl. Exped. p. 363, tab. xxx. fig. 462.

Roy Cove, at half-tide.

Dr. Hermann Streb., joins the next species on our list (*redimiculum*, Reeve) with this. We, however, decide, for the present at all events, to treat them as distinct.

##### *Siphonaria redimiculum*, Reeve.

*Siphonaria redimiculum*, Reeve, Conch. Icon. ix. pl. v. fig. 21 (1856); E. A. Smith, Moll. of Kerguelen, in Trans. Royal Soc. Lond. p. 16 (1879).

*Siphonaria lateralis*, Couthouy, non *redimiculum*, Reeve, H. Streb., Mollusk. der Magalhaen-Provinz, Zool. Jahrb. Band xxv. p. 172.

Roy Cove, on fringe of high-water mark; Crooked Inlet, under stones and on rocks.

*Siphonaria tristensis*, Leach.

*Siphonaria lessoni*, Blainville, d'Orbigny, Voy. MÉR. p. 469, tab. lvi. figs. 12, 13, 14.

*Siphonaria tristensis*, Reeve, Conch. Icon. v. sp. 23.

*Siphonaria læviuscula*, Reeve, l. c. sp. 5.

Roy Cove, on rocks at half-tide.

The form or var. *læviuscula*, Reeve, occurs at Dip Creek, Roy Cove, Shallow Bay, on rocks; Rapid Point, at low tide; and is, no doubt, generally distributed throughout the area.

Fam. *Limnæidæ*.*Limnæa diaphana*, King.

*Limnæa diaphana*, King, Zool. Journ. v. p. 339 (1832); Reeve, Conch. Icon. xviii. spec. 30; H. Streb. l. c., Zool. Jahrb. Band xxv. p. 163, Taf. viii. fig. 100 a-c (1907).

Port North Lake.

*Limnæa patagonica*, Streb.

*Limnæa patagonica*, H. Streb. l. c. p. 164, Taf. viii. fig. 103 a, b (1907).

Freshwater Pond, Port North; Lake near Teal River Settlement; Herbert Station, Roy Cove.

Very fine and perfect examples, of a bright transparent horn-colour, not corroded apically as is so often the case.

*Chilina fluviatilis*, Gray.

*Chilina fluviatilis*, Gray, Reeve, Conch. Syst. pl. clxxxix. fig. 5, and Conch. Icon. xix. pl. i. fig. 1.

Port North Lake.

*Chilina subcylindrica*, Sowb.

*Chilina subcylindrica*, G. B. Sowerby, in Reeve, Conch. Icon. xix. pl. iii. fig. 16 (1874).

Herbert Stream; Crooked Inlet.

The original specimens came from Chili. Our species seems to harmonize with it, but may possibly be a very nearly allied new form.

Class *PELECYPODA*.

## Order PROTOBRANCHIATA.

## Family Nuculidæ.

*Nucula pisum*, Sowb.

*Nucula pisum*, Sowerby, Thes. Conch. iii. p. 153, pl. ccxxix. fig. 133;  
Trans. Royal Soc. Edinb. xlviii. p. 360.

Local, but occasionally plentiful.

This is probably *N. semiornata*, Orbigny. It was originally described by Sowerby in P. Z. S. Lond. 1832.

*Yoldia eightsii* (Couth.).

*Nucula eightsii*, Couthouy, Jay, Cat. Shells, ed. iii. p. 113, pl. i. figs. 12, 13 (1839).

*Leda (Yoldia) eightsii*, Hanley, in Sowb. Thes. Conch. iii. p. 142, pl. ccxxx. fig. 164.

*Yoldia eightsii*, Sowerby, Reeve, Conch. Icon. xx. pl. v. fig. 26.

Roy Cove, at extreme low-water mark, spring tides.

*Yoldia woodwardi*, Hanl.

*Yoldia woodwardi*, Hanley, P. Z. S. Lond. p. 370 (1860); Reeve, Conch. Icon. xviii. pl. i. fig. 9 (1871); Pelseneer, Voy. 'Belgica,' Moll. p. 10 (1903); Lamy, Moll. Orcades du Sud, Bull. Mus. Hist. Nat. xii. p. 125 (1900); Charcot, Exp. Ant. Française, p. 19 (1906).

Roy Cove, 4-6 fathoms (November 1909).

Very perfect examples, three in number.

## Order FILIBRANCHIATA.

## Suborder ANOMIACEA.

## Fam. Anomiidæ.

*Anomia ephippium*, L.

*Anomia ephippium*, Linné, Syst. Nat. xii. (1769); Jeffreys, Brit. Conch. ii. p. 30, pl. i. fig. 4; Smith, Report 'Challenger' Exped., Zool. xiii. p. 318.

Roy Cove.

One of the very few species found to be common to the northern and southern polar regions.

## Suborder ARCAEA.

## Fam. Arcadæ.

*Limopsis hardingii*, sp. n. (Pl. VII. figs. 2, 2 a.)

*L. testa* crassiuscula, albida, nitida, obliquante, superficie undique concentrice irregulariter striata, versus marginem ventralem longitudinaliter radiatim multistrigata, aliter lævi, umbonibus parvis, acuminatis, pagina intus alba, lævi, margine simpliciter planato, cardine regulari, dentibus ad 10 utrinque instructis, linea palliali haud sinuosa.

Alt. 26, lat. 28, diam. 9 mm.

Roy Cove.

Compared with the known species of the genus, this comes, perhaps, nearest to *L. pelagica*, Smith, than which it is far less oblique, larger, and more substantial. *L. grandis* and *marionensis*, both also of Smith and from southern latitudes, are comparable in a lesser degree. Our only example was found denuded of its periostracum. We have been requested by Mr. Vallentin to associate with this fine *Limopsis*, of which we hope better examples will some day be brought to light, the name of Mr. W. H. Harding, Colonial Manager of the Falkland Isles Company, who has rendered much service in local biological investigation.

## Subfam. PHILOBRYINÆ.

*Philobrya* sp.

Roy Cove.

Immature, and only serving to demonstrate the presence of this genus in the W. Falklands.

## Suborder MYTILACEA.

## Fam. Mytilidæ.

*Mytilus bifurcatus*, Conr.

*Mytilus bifurcatus*, Conrad, Journ. Amer. Nat. Sci. Phil. v. 7, pl. cexli.

Roy Cove.

*Mytilus edulis*, L.

*Mytilus edulis*, Linné, Syst. Nat. xii. ed. p. 1157 (1769); Forbes & Hanley, ii. p. 170, pl. xlviii. figs. 1-4; Jeffreys, Hist. Conch. ii. p. 104 (1863); Smith, Phil. Trans. Royal Soc. Lond. clxviii. p. 189 (1879).

Common, and, as in case of *Anomia ephippium*, found both in the north and south polar areas.



*Mytilus magellanicus*, Chem.

*Mytilus magellanicus*, Chem. Conch. Cab. viii. pl. lxxxiii. fig. 742;  
Reeve, Conch. Icon. x. pl. vi. fig. 22.

Roy Cove Creek.

One specimen shows a curious graduated malformation, being unusually incrassate in the centre of each valve.

*Brachyodontes (Hormomya) blakeanus*, sp. n.  
(Pl. VII. figs. 4, 4 a.)

*B. testa alba, lata, epidermide sordide brunnea partim induta, ovato-triangulari, parva, haud multum tumescente, postice leniter rotundata, antice apud umbones acuminata; mox expansa, superficie undique radiatim irregulariter filolirata, interstitiis sub lente arcte spiraliter striatulis; periostraco imbricato, marginem superimpendente, pagina intus alba, marginibus circa crenulatis, septo minimo.*

Alt. 5, lat. 8 mm.

Roy Cove.

In form, and to some extent in sculpture, like a small *Br. cubitus*, Say, and, with this, we consider it should be placed in the subgenus *Hormomya*, Mörch. We would refer to an exhaustive paper on the classification of the Mytilidæ by Mr. A. J. Jukes-Browne, F.R.S.\*

At Mr. Vallentin's request we name this shell in honour of Mr. Robert Blake, Chairman of the Directors of the Falkland Islands Company, who evinced much interest in the scientific work and aided it by all means in his power.

*Modiolarca exilis*, H. & A. Ad.

*Modiolarca exilis*, H. & A. Adams, P. Z. S. 1853, p. 435; E. A. Smith, Phil. Trans. Royal Soc. Lond. vol. clxviii. p. 190, pl. ix. fig. 24 (1879).

Fox Bay, after a severe shore-gale.

*Modiolarca trapezina* (Lam.).

*Modiola trapezina*, Lamarck, Anim. sans Vert. vol. vii. p. 24; Delessert, pl. xiii. fig. 7.

Roy Cove, 2-4 fathoms; Crooked Inlet, at low water, widely distributed.

\* Proc. Malac. Soc. Lond. 1905, pp. 211-224.

## Order PSEUDOLAMELLIBRANCHIATA.

## Fam. Pectinidæ.

*Pecten rufiradiatus*, Reeve.

*Pecten rufiradiatus*, Reeve, Conch. Icon. viii. pl. xxxii. fig. 147 (1853).

Low water, Whaler Point and Roy Cove.

A neat small species, like *P. patagonicus*, King, in miniature. A large dead valve, somewhat characterless, found on the N.W. Falkland coast after a storm, probably belongs to this latter species (*patagonicus*).

## Order EULAMELLIBRANCHIATA.

## Suborder SUBMYTILACEA.

## Fam. Carditidæ.

*Cardita naviformis*, Reeve.

*Cardita naviformis*, Reeve, P. Z. S. Lond. (1843); Conch. Icon., "Cardita," pl. ix. fig. 45 (1844).

Only one example found. Is probably a *Carditella*, Smith.

## Fam. Lucinidæ.

*Cryptodon falklandicus*, Sm.

*Cryptodon falklandicus*, E. A. Smith, Rep. 'Challenger' Exped., Zool. xiii. p. 190, pl. xiv. figs. 3, 3 a (1885); Trans. Royal Soc. Edinb. xlv. p. 148 (1907).

Roy Cove, 4-6 fathoms.

This species, as has been previously reported by us, was found by Miss Cobb at Shallow Bay, Lively Island, Falklands, and at Scotia Bay, South Orkneys (*W. S. Bruce*, S. N. A. Expedition).

## Fam. Kellyellidæ.

*Cyamium falklandicum*, Melvill & Standen.

*Cyamium falklandicum*, Melvill & Standen, Journ. of Conch. ix. p. 104, pl. i. fig. 22 (1898).

Crooked Inlet, under stones; King George's Bay.

Accompanying this a bottle was forwarded, containing a mass of filmy Algæ, in which were very considerable numbers of a small white Pelecypod, which we deem the ffy of either *C. falklandicum* or its very near congener *iridescens*, Cooper and Preston.

This agglomeration was found spread over a boulder-stone, exposed at low tide in the upper portion of Roy Cove Creek, on January 14th, 1910. There must have been thousands of these little mollusks imbedded thus, for upon removing it from the rocks on which it was spread the effect was that of little white stars or points of light, sometimes iridescent. Miss Wigglesworth, of the Manchester University, has kindly examined and analyzed this Algoid mass, and pronounced it mainly to consist of the cosmopolitan *Chlorosperm* alga *Enteromorpha compressa*, with a species of *Conferva*.

CYAMIONEMA, subgen. nov.

*Cyamium* (*Cyamionema*) *decoratum*, sp. n.

(Pl. VII. figs. 5, 5 a, 5 b.)

*C. testa parva, delicatissima, papyracea, alba, æquivalvi, inæquilaterali, umbonibus contiguis, margine dorsali recto, ventrali fere parallelo, latere antico rotunde extenso, postice truncatulo, superficie concentricè undique irregulariter striata, sæpe periorstraco tenui olivaceo-straminea induta, ab umbonibus ventralem ad marginem centraliter oblique filoso-lirata, liris numero 7-8, pagina intus alba; valva dextra duobus dentibus parvis contiguis instructa, sinistra uno dente majore prominulo, lateralibus omnino evanidis, ligamento interno nullo, externo perlongo, pallide stramineo, linea palliali integra.*

Alt. 3, lat. 5 mm., sp. max.

*Hab.* N.W. Falklands, 5-6 June, 1910.

This is a very delicate white shell, of extreme fragility, so much so that nearly all the specimens have been fractured in the course of microscopical examination. In several ways we consider it differs from the normal *Cyamium*, and justification for the creation of the proposed subgenus appears, we think, firstly, in the absence of the internal ligament; secondly, in dental disposition, the right valve containing two small contiguous teeth, the left only one, but that larger and more conspicuous, the lateral teeth in either valve apparently absent altogether; and, thirdly, in the external sculpture, both valves being ornamented, in addition to the concentric lines, with seven or eight thread-like liræ proceeding radiately from the umboes to about the centre of the ventral margin. From this circumstance the name *Cyamionema* is suggested—*κνᾶμιον* and *νήμα*, a thread.

We would here especially thank Mr. A. J. Jukes-Browne, F.R.S., for his examination of this interesting shell and his comments thereupon. Several new species of *Cyamium* have, during the past few years, been described by Mr. H. B. Preston and others, but none seem comparable with the one

before us. *C. subquadratum*, Pelseneer\*, and *C. imitans*, Pfeffer†, are probably the nearest in contour of form.

### Family Erycinidæ.

#### *Lascea consanguinea* (Smith).

*Kellia consanguinea*, E. A. Smith, Phil. Trans. Royal Soc. Lond. vol. clxviii. p. 184, pl. ix. fig. 20 (1879).

Crooked Inlet, under stones; Roy Cove, attached to byssus of *Mytilus magellanicus*.

#### *Lascea miliaris*, Phil.

*Kellia miliaris*, Philippi, Wiegmann's Archiv für Naturg. p. 51 (1845).

King George's Bay.

#### *Kellyia cycladiformis* (Desh.).

*Erycina cycladiformis*, Deshayes, Trait. Élem. pl. xi. figs. 6-9; P. Z. S. Lond. p. 181 (1851).

*Kellia cycladiformis* (Desh.), Melvill & Standen, Trans. Royal Soc. Edinb. xlv. p. 149 (1907).

Rapid Point; found within a large dead *Balanus* at extreme low-water mark.

#### *Davisia cobbi*, C. & P.

*Davisia cobbi*, Cooper & Preston, Ann. & Mag. Nat. Hist. ser. 8, vol. v. pp. 113, 114, pl. iv. figs. 9, 10 (1910).

King George's Bay; Crooked Inlet, under stones; Roy Cove, at low water, spring tides; and also dredged at 4-6 fathoms.

This also occurred at Burdwood Bank, S. of the Falklands (*W. S. Bruce*).

### Fam. Cyrenidæ.

*Sphærium vallentinianum*, sp. n. (Pl. VII. figs. 3, 3 a, 3 b.)

*Sph.* testa convexo-globosa, tenui, paullum obliqua, lævigata, umbonibus rotundatis, contiguis, epidermide pallide olivaceo-straminea cincta, superficie concentrice lineis incrementalibus paucis distantibus conspicuo prædita, margine dorsali utrinque leniter

\* Pelseneer, Voy. du S.Y. 'Belgica,' Zoologie, p. 15, pl. ix. fig. 124 (1903).

† J. Thiele, Deutsche Süd-Polar Exped. xiii. Band, Heft 2, p. 270, pl. xviii. fig. 23 (1912).

declivi, lateribus ad marginem ventralem rotundatis, postice paulum protenso, pagina intus alba, cardinis dentibus normalibus. Alt. 4.50, lat. 5 mm.

*Hab.* Herbert Stream, Roy Cove, on mud; also in large pond, Port North.

Interesting, as the first non-marine Pelecypod recorded from these islands. Its nearest congeners, perhaps, are *S. novæzelandiæ*, Desh., and *S. ovale*, Stimps. There appear two forms, one slightly smaller and more oblique. We name it specifically in honour of its discoverers, Mr. and Mrs. Rupert Vallentin, whose researches, both botanical, zoological, and biological, have proved of such lasting service to the students of the productions of these remote southern climes.

#### Suborder C A R D I A C E A.

##### *Cardium edule*, L.

*Cardium edule*, Linné, Syst. Nat. p. 1124; Forbes & Hanley, ii. p. 15, pl. xxxii. figs. 1-4.

King George's Bay.

#### Suborder V E N E R A C E A.

##### Fam. Veneridæ.

##### *Cryptogramma subimbricata*, Sowb.

*Venus subimbricata* (Sowb.), Reeve, Conch. Icon. xiv. pl. xix. fig. 85.

Roy Cove Beach, after south-westerly gale; only one brightly coloured and well-marked half-valve.

The original locality of this species, hardly to be expected so far south, is Puerto Portrera, Central America (*Hugh Cuming*). We consider its presence in the West Falklands must be owing to adventitious circumstances.

##### *Gomphina (Acolus) foveolata* (C. & P.).

*Psephis foveolata*, Cooper & Preston, Ann. & Mag. Nat. Hist. ser. 8, vol. v. pp. 110-114, fig. (1910).

*Gomphina (Acolus) foveolata*, A. J. Jukes-Browne, Ann. & Mag. Nat. Hist. ser. 8, vol. xii. p. 480 (1913).

Whaler Bay; Shallow Bay; King George's Bay.

We are obliged to Mr. H. B. Preston, one of the authors, for the identification of this very interesting species, which is, apparently, being found to be generally distributed around the Falkland group. Mr. Jukes-Browne has also kindly favoured us with good specimens.

## Fam. Mactridæ.

*Darina solenoides* (King).*Erycina solenoides*, King, Zool. Journ. v. p. 335 (1832).*Darina solenoides*, Gray, Ann. & Mag. Nat. Hist. ser. 2, vol. xi. p. 42 (1853).*Darina kingi*, Fischer, Man. de Conch. p. 1119 (1887).*Lutraria tenuis*, Phil. Wiegmann's Archiv für Naturg. 1845, p. 70.*Darina solenoides*, E. A. Smith, Proc. Malac. Soc. Lond. vi. p. 337 (1905).

Roy Cove. At low water, in and upon muddy banks.

This species extends around the Straits of Magellan, but does not appear otherwise than sparingly. It is reported by Mr. Edgar Smith from Tierra del Fuego, on San Sebastian Beach (*Crawshay*). Rear-Admiral Philip Parker King, R.N., F.R.S., the discoverer, collected it first at Port Famine, Straits of Magellan.

The *Lutraria solenoides*, Lamarck, is, according to Gwyn-Jeffreys, the British *L. oblonga*. Lamarck, indeed, quotes this name in his synonymy, giving "Océan d'Europe" as the locality. We are indebted to Mr. Edgar Smith for this information.

## Suborder TELLINACEA.

## Fam. Tellinidæ.

*Tellina squalida*, Pult.*Tellina squalida*, Pulteney, in Hutchins. Dorset, p. 29 (1774).*Tellina incarnata*, Forbes & Hanley, i. p. 298, pl. xx. fig. 6; Sowerby,

Illustr. Index Brit. Moll. pl. iii. fig. 14 (1859).

*Tellina squalida*, Jeffreys, Brit. Conch. ii. p. 384 (1863).

Crooked Island, at low water.

We cannot separate this from the European and British species. It is represented in the collection before us by a single right valve—this being, however, in fairly good condition, shining, yellowish flesh-colour, slightly rayed anteriorly.

## Suborder MYACEA.

## Fam. Myidæ.

*Mya antarctica*, sp. n. (Pl. VII. figs. 6, 6 a.)

*M. testa mediocri, rudi, calcarea, sordide alba, inequali, hiulca, umbonibus incurvis, parvis, contiguis, superficie concentrice rudi-striata, antice subrotundata, margine ventrali fere recto, postice truncata, epidermide evanide olivaceo-brunnea, pagina intus*

calcareo-alba, parum nitente, cardine valvæ sinistræ dente spathulato magno, dextræ fossa congruente prædito, ligamento interno.

Alt. 11, lat. 16 mm.

*Hab.* "N.W. Falklands."

We can find no *Mya*, till now, recorded from the Southern Hemisphere. This new form much resembles, at first sight, a miniature *M. truncata*, L., but, as first pointed out to us by Mr. Edgar Smith, the concentric lines and sculpture anteriorly are closer and altogether different in character.

In 1898 we published the description, under the name *Thracia antarctica*, of a shell from Lively Island, E. Falklands, collected by Miss Cobb \*. We think it possible this may be the same species. It was rather larger, ruder in build, and distorted, so that we considered it, at the time, most allied to *Thracia distorta*, Phil. The discovery of a good series of specimens is much to be desired, both of this and the *Mya*, when the question may be cleared up.

#### *Saxicava arctica* (L.).

*Mya arctica*, Linné, Syst. Nat. p. 1113.

*Saxicava arctica* (L.), Forbes & Hanley, i. p. 141, pl. vi. figs. 4-6.

#### Var. *antarctica*, Phil.

*Saxicava antarctica*, Philippi, Archiv für Naturg. (1845); Trans. Royal Soc. Edinb. xli. p. 151 (1907).

Port Egremont, on the beach after a gale, also at the roots of *Macrocystis* and other fucoid algæ.

#### Fam. Solenidæ.

##### *Solen macha*, Mol.

*Solen macha*, Molina, Hist. Nat. du Chile, p. 178 (1787); Gmelin, Syst. Nat. p. 3226; D'Orbigny, Amér. Mérid. p. 505; Gay, Hist. de Chile, Zool. vol. viii. p. 369, pl. viii. fig. 6.

*Solen gladiolus*, Gray, in Beechey's Voyage 'Blossom,' p. 153, pl. xliii. fig. 4.

*Solen macha*, Reeve, Conch. Icon., *Solen*, fig. 28; "Oken," Martini & Chemnitz, Conch. Cab. Taf. viii. p. 26, fig. 5 (1888).

Sandy beach on Pebble Island, after severe shore-gales.

"This beach faces due north, and appears to be the only locality for this species in the Falkland Is. It was impossible to hunt for them, and so procure live examples, owing to the heavy surf."—*R. V.*

A very fine and large species.

\* Journ. of Conch. ix, p. 105, pl. i. figs. 13, 13 a (1898).

## Suborder ANATINACEA.

## Fam. Lyonsiidae.

*Lyonsia cuneata* (Gray).*Anatina cuneata*, J. E. Gray, Spicil. Zool. pl. iii. fig. 14.? *Lyonsia malvinensis*, vide Fischer, Man. de Conch. p. 172 (1837).

Rapid Point, Port Egremont; also Roy Cove, small, live examples.

We cannot discover either a description of *L. malvinensis* or authority for the appellation, and therefore conjecture it to be a mere *nomen nudum*. The specimens from the localities above quoted are small, few, and sometimes distorted; we are not quite sure, therefore, whether they have been distinguished aright. *L. cuneata*, Gray (*Osteodesma*, Desh.), was reported from Port Stanley, East Falklands, on stranded roots of *Macrocystis*, by the Scottish National Antarctic Expedition (1902–1905).

## EXPLANATION OF PLATE VII.

Fig. 1. *Savatieria bertrandi*, sp. n.Fig. 2. *Limopsis hardingii*, sp. n.Fig. 3. *Sphærium vallentinianum*, sp. n.Fig. 4. *Brachyodontes* (*Hormomya*) *blakeanus*, sp. n.Fig. 5. *Cyanum* (*Cyamionema*) *decoratum*, sp. n.Fig. 6. *Mya antarctica*, sp. n.Fig. 7. *Voluta ancilla*, Sol. (embryonic).XIII.—*Descriptions and Records of Bees*.—LVI.

By T. D. A. COCKERELL, University of Colorado.

*Stenotritus elegans*, Smith, variety *a*.

A female from Tennant's Creek, Central Australia (*Field*; Nat. Mus. Victoria, 46), has apparently been in alcohol, and the pubescence is in bad condition. So far as can be made out, there is no fuscous hair on the thorax above, and no black hair on the abdomen. The mesothorax shows olive-green tints in front. The first r. n. joins the second s.m. a little before the middle, instead of a little beyond as in Smith's type of *S. elegans*. Possibly this is a distinct species, but it cannot be satisfactorily separated without better material.

No males assigned to *Stenotritus* are known; but it seems



very probable that the genus *Gastropsis*, Smith, represents the male sex of *Stenotritus*. The two agree in venation and the structure of the metathorax.

*Paracolletes crassipes*, Smith.

A male from Caloundra, Oct. 30, 1912 (Queensl. Mus. 73), is peculiar in the venation, the third s.m. being extremely broad above, and the third t.-c. strongly bowed outward, with only a single curve.

*Paracolletes nigrofulvus*, sp. n.

♂.—Length about  $11\frac{1}{2}$  mm., rather slender.

Black, with the hind margins of the abdominal segments, and the hind tarsi, obscurely ferruginous; hair of head and thorax abundant, mostly pale ochreous, but brownish black on sides of face, on front and vertex (but not on occiput), on mesothorax except anteriorly, and on scutellum; flagellum strongly crenulated beneath, scarcely reddish; head broad, facial quadrangle much broader than long; mandibles dark; clypeus densely covered with light ochreous hair, but just above the hair is brownish; mesothorax and scutellum shining, very sparsely and feebly punctured; postscutellum unarmed; area of metathorax smooth and shining, obtusely transversely ridged in middle. Legs with ochreous hair; spurs testaceous; tegulae shining piceous. Wings dusky; nervures and the large stigma red-brown; b. n. meeting t.-m.; second s.m. receiving first r. n. distinctly before middle; third s.m. receiving second r. n. a little before the end; third s.m. nearly or quite twice as large as second. Abdomen shining, without evident punctures, the basal segments with thin pale ochraceous hair, but on the third and beyond this gives way to black, very short and scanty until the sixth segment, on which it is long; the sides subapically show long pale hair; apical plate broadly expanded at end, truncate.

*Hab.* Shoalhaven, New South Wales, March 9, 1894 (*Froggatt*, 72).

In my table in Trans. Amer. Ent. Soc. 1905, p. 345, this runs to 15, and runs out because of the ochraceous and black hair. It is related to the Tasmanian *P. obscurus* (Sm.). In my table in Ann. & Mag. Nat. Hist., Jan. 1906, it runs to *P. obscuripennis*, Ckll., a related but much smaller Tasmanian species.

*Paracolletes providellus bacchalis*, subsp. n.

♂.—Length a little over 7 mm.

Differing from *providellus* as follows: abdomen with only the faintest greenish tinge, easily overlooked; hind tibiæ, and basal half of their basitarsi, bright chestnut-red; hair of face stained with fuscous, of scape, front, and vertex dark fuscous or black; tegulæ piceous; hind margins of abdominal segments hardly at all reddish; b. n. meeting t.-m.

*Hab.* Bacchus Marsh, 2. 1. 06 (*F. L. Billinghamurst*; Nat. Mus. Victoria, 88).

I should have thought this a new species, were it not that the two following varieties appear to connect it with *P. providellus*:—

Variety *a.* Abdomen distinctly dark green; hind tibiæ and greater part of basitarsi chestnut-red. Victoria, Sept. 1901 (*C. French*; Turner collection).

Variety *b.* Abdomen distinctly dark green; hind legs coloured as in the other forms, except that the tibiæ have a broad dusky shade beyond the middle. Windsor, Victoria (*French*; Froggatt coll. 186).

*Paracolletes ibex*, sp. n.

♂.—Length 8 mm.

Slender, black; hair of head and thorax long, greyish white, black on sides of face and on vertex; mesothorax and scutellum with very long black hairs; upper part of face with a little black hair; head broad; mandibles red at apex; clypeus dullish, not strongly punctured; flagellum dark, crenulated below, and the margins of the joints projecting above, the whole suggesting the horns of an ibex; mesothorax moderately shining, little punctured; scutellum dull and granular; area of metathorax large, dull, shining at extreme base. Legs slender, black, with pale hair; spurs creamy white; tegulæ piceous. Wings a little dusky, nervures and the large stigma dusky ferruginous; b. n. meeting t.-m.; second s.m. broad, receiving first r. n. a little beyond middle; third s.m. broad above, receiving second r. n. some distance from end. Abdomen dullish, black, hardly punctured, hind margins of segments obscure reddish; hair of abdomen very thin, scattered, pale, but dark fuscous at apex; ventral segments with thin white hair-fringes.

*Hab.* Windsor, Victoria (*French*, 1909; Froggatt coll. 95).

Allied apparently to *P. cinereus* (Sm.), but differing by the black legs and other characters. Easily known from *P. providellus bacchalis* by the peculiar antennæ.

*Paracolletes semipurpureus* (Cockerell), var. *b*.

♀.—Vertex, thorax above, and tubercles with light orange-fulvous hair, contrasting with the white of face, pleura, and metathorax; anterior and middle basitarsi almost entirely black; red of hind tibiæ and tarsi rather dusky. Abdomen strongly crimson, the hair at end mostly whitish, but fuscous at extreme apex; b. n. meeting t.-m.

*Hab.* Rutherglen, Victoria (*French*, 1909; Froggatt coll. 87).

This is a variable species, but I believe certainly distinct from *P. cupreus* (Sm.), with which it was at first associated as a subspecies. A specimen of *P. cæruleotinctus*, Ckll., is also labelled Rutherglen, 1909 (*French*; Froggatt coll. 85).

*Paracolletes sigillatus*, sp. n.

♀.—Length 10 mm.

Black, including the legs (tarsi reddish at end), the short flagellum ferruginous beneath except at base, the mandibles dark red apically, and the hind margins of the abdominal segments broadly testaceous; hair of head and thorax pale ochreous dorsally, somewhat fuscous on vertex, but on face, cheeks, pleuræ, and metathorax dull white; head broad; clypeus only moderately shining, with scattered punctures; mesothorax shining, with weak punctures; scutellum shining in front, dull and rough behind; postscutellum angularly produced behind, with a small shining button-like tubercle (suggesting the seal on the flap of an envelope, whence the specific name); area of metathorax dull, but other parts of metathorax brilliantly shining. Legs with pale hair, hind tibial scopa suffused with fuscous on outer side; tegulæ dark rufo-piceous. Wings dusky, nervures and stigma dark brown; b. n. falling a little short of t.-m.; stigma lanceolate; marginal cell long and narrow; second s.m. small, receiving first r. n. a little before middle; third s.m. very large, more than twice as large as second, as broad above as second is below, receiving second r. n. as far from its end as first r. n. is from base of second s.m. Abdomen shining, not punctured, densely covered apically with very pale dusky ochreous hair, and bands of the same covering the pallid margins of the third and fourth segments, and of the second at sides.

*Hab.* South Australia ; the specimen is 74 of the Froggatt collection, and is labelled "S. Aust., W. W. F., Blackburn, 1909."

By the character of the postscutellum, the large third submarginal cell, &c., this falls next to *P. tuberculatus*, Ckll., but it has a very different abdomen.

*Paracolletes humerosus cydnurus*, subsp. n.

♀.—Length a little over 9 mm.

Rather slender ; hair of vertex and dorsum of thorax (except broad anterior corners of mesothorax) black ; the large humeral hair-patches very conspicuous, white, with a faint creamy tint ; abdomen shining, distinctly purplish, the hind margins of the segments broadly reddened ; hair at apex black ; pygidial plate bright ferruginous. The legs agree with *humerosus* as described by Smith ; stigma and nervures dark ferruginous ; first r. n. entering second s.m. before middle (as in *humerosus*) ; third s.m. very broad above.

*Hab.* "Oakley, Victoria" (*French*, 1909 ; Froggatt coll. 78).

Possibly a distinct species, but certainly very close to *P. humerosus* (Smith).

*Paracolletes rebellis*, Cockerell.

Three from Nat. Mus. Victoria (113, 114, 115), one from Woodend, the others without locality.

*Paracolletes melbournensis*, Cockerell.

Rutherglen, Victoria (*French* ; Froggatt coll. 193) ; no locality (Nat. Mus. Victoria, 101).

*Paracolletes leai*, Cockerell.

Wilson's Promontory, Christmas 1905 (*J. A. Kershaw*, Nat. Mus. Vict. 264) ; Buchan, Jan. 20, 1907 (Nat. Mus. Vict. 81) ; King I., Tasmania (*J. A. Kershaw* ; Nat. Mus. Vict. 204, 205, 208).

*Paracolletes tuberculatus*, Cockerell.

Oakleigh (*B. Hill* ; Nat. Mus. Vict. 79) ; no locality (Nat. Mus. Vict. 82).

*Paracolletes argentifrons*, Smith, var. *a*.

W. Australia (*F. Duboulay*, Nat. Mus. Vict. 73).

*Paracolletes providus*, Smith.

Near Melbourne (Nat. Mus. Vict. 262); no locality (Nat. Mus. Vict. 87); N.S. Wales (*J. A. Kershaw*, Nat. Mus. Vict. 83).

*Paracolletes viridicinctus*, Cockerell.

Croydon, Jan. 11, 1909 (*S. W. Fulton*; Nat. Mus. Vict. 91, 92, 94). Perhaps not quite typical, but not to be separated.

*Parasphecodes vermiculatus*, sp. n.

♂.—Length 9 mm.

Parallel-sided, not very slender; head, thorax, and the long antennæ black; clypeus with the apical part broadly cream-colour, the light area coming to a point in middle above; labrum black, with the transverse projecting edge ferruginous; mandibles black; tongue short and broad; hair of head and thorax dull greyish white, rather scanty; eyes strongly converging below; mesothorax and scutellum entirely dull and minutely granular; pleura rugulose; area of metathorax large, sharply bounded in middle behind, entirely covered with strong vermiform rugæ, the depressions between them shining, and quite without a smooth posterior margin; tegulæ dark rufous with a darker spot. Wings hyaline, conspicuously dusky at apex; stigma dark rufous, nervures fuscous; second s.m. very broad; first r. n. meeting second t.-c.; third s.m. quadrate, broad above, with the outer side bulging; outer nervures not weakened; femora black, with the knees red; tibiæ bright chestnut-red, the hind ones more or less suffused with dusky; tarsi black, with apex of last joint red. Abdomen bright chestnut-red, the fifth segment and beyond black or nearly; first two segments very minutely punctured; suture between first and second somewhat depressed, but not that between second and third; first segment wholly red; no lateral hair-patches; a black patch on ventral side at extreme base.

*Hab.* Australia, presumably Victoria; Nat. Mus. Victoria, 173, presented by G. F. Gill.

In my table in *Ann. & Mag. Nat. Hist.*, Sept. 1904, this runs to *P. stuchila*, Sm., differing by the densely wrinkled base of metathorax, first abdominal segment (dorsal) entirely red, third segment not depressed at base, and first r. n. meeting second t.-c. Otherwise it agrees with Smith's account of *P. stuchila*, and my notes on the type. The

combination of red tibiae with black tarsi is a striking feature, and throws it entirely out of the table in Trans. Amer. Ent. Soc., Aug. 1910.

*Parasphcodes arciferus*, sp. n.

♀.—Length 9 mm., expanse a little over 18.

Head, thorax, antennae, and legs black, except that the flagellum is ferruginous beneath apically (this is not conspicuous), and the tarsi are obscurely reddish at apex; hair of head and thorax greyish white; head broad; clypeus shining, with sparse distinct punctures and a strong median depression; mandibles dark red subapically; vertex shining; mesothorax and scutellum densely and rather coarsely punctured, the shining surface visible between the punctures on scutellum and hind part of mesothorax; tubercles densely fringed with white hair; area of metathorax peculiar, the hind margin thickened and obtuse, but interrupted in middle, so that the rather narrow area proper, which is finely obliquely striate, has its hind edge curved on each side and pointed in the middle, like a printer's bracket; sides of metathorax very hairy. Legs with pale hair, middle femora with a fulvous tuft beneath at base; hind spur simple; tegulae rufo-piceous. Wings hyaline, broadly dusky apically; stigma dark reddish, nervures sepia, third t.-c. and second r. n. conspicuously weakened; stigma rather small; second s.m. very broad, receiving first r. n. before its end; third s.m. much broader below than above. Abdomen chestnut-red, the basal half of first segment black, the third segment suffused with blackish, the fourth and fifth black, the hair at apex dark sooty; first two segments conspicuously punctured, the punctures well separated on middle of second; very small white hair-patches at sides of base of segments 2 and 3; fourth and following ventral segments black; second ventral segment with a large median tubercle.

*Hab.* Mordialloc, Victoria (*F. P. Spry*; Nat. Mus. Vict. 256).

In the table in Ann. & Mag. Nat. Hist., Sept. 1904, this falls with *P. tuchilas*, Sm., and *P. lichatus*, Sm. In *P. tuchilas* the area of metathorax is bounded by a sharp ridge, and the hind margins of the first two abdominal segments are darkened. In *P. lichatus* the metathorax is also unlike that of *P. arciferus*. From all the similar species, *P. arciferus* is readily known by the tubercle on the second ventral segment of abdomen.

*Parasphecodes fultoni*, sp. n.

♀.—Length 9 mm.

Head, thorax, antennæ, and legs black, with light ochraceous pubescence, becoming light fulvous dorsally; mandibles obscurely reddish apically; clypeus shining apically, dull basally, strongly punctured, without a median groove; mesothorax densely and finely rugoso-punctate; scutellum similarly punctured, but bigibbous, with a median sulcus, the summits of the elevations shining; area of metathorax large, covered with strong rather wavy longitudinal rugæ, except a narrow apical band just before the semicircular rather sharp edge; upper part of truncation with a rather inconspicuous but long tuft of pale hair; inner side of tarsi with reddish hair; tegulæ bright clear fulvous. Wings dusky, darker apically; stigma dull ferruginous, large; nervures sepia, third t.-c. and second r. n. weakened; second s.m. small; first r. n. meeting second t.-c.; third s.m. broader below than above. Abdomen with the first two segments chestnut-red (the first not black at base), very finely punctured; third more dusky, nearly half covered by a large broad blackish triangular area, but hind margin broadly red; fourth black, with the hind margin dull red; apical segments black, and hair at apex black; second and third segments with fine white pile at extreme base laterally.

*Hab.* Croydon, Australia, Jan. 11, 1909 (*S. W. Fulton*; N. Mus. Vict. 189).

Mr. Fulton, on the same day, took *P. speculiferus*, Ckll. (N. Mus. Vict. 199), at Croydon; it is very like *P. fultoni*, but differs in the colour of the hair, the darker tegulæ, and the finer, not wrinkled, rugæ of metathoracic area. *P. fultoni* is also closely allied to *P. cirriferus*, Ckll., but much smaller.

*Parasphecodes plorator*, Cockerell.

The original type was labelled Melbourne, but seven specimens now before me were all collected by Mr. S. W. Fulton at Croydon (Nat. Mus. Victoria, 90, 95, 98, 241, 242, 244, 245).

The females of the black or almost black species of *Parasphecodes* known to me may be separated as follows:—

- |   |                             |
|---|-----------------------------|
| Area of metathorax without rugæ .....                           | <i>plorator</i> , Ckll.     |
| Area of metathorax with rugæ .....                              | 1.                          |
| 1. Apical half of abdominal venter with coarse black hair ..... | <i>fumidicaudus</i> , Ckll. |
| Apical half of abdominal venter with light hair .....           | 2.                          |

2. Second ventral segment of abdomen with a dense tuft of hair covering the slight median elevation ..... *noachinus*, Ckll.  
 Second ventral segment without such a tuft of hair; mesothorax more densely punctured.. 3.  
 3. Tubercle on second ventral segment low; abdomen wholly black ..... *dissimulator*, Ckll.  
 Tubercle on second ventral segment high; first three segments of abdomen very dark red..... *atrorufescens*, Ckll.

There is one other species, *P. carbonarius* (*Halictus carbonarius*, Smith). This is nearest to *P. noachinus*, but smaller, with more dark hair on the legs.

*Parasphcodes fumidicaudus*, sp. n.

♀.—Length  $10\frac{1}{2}$  mm.

Pitch-black (including the legs), flagellum reddish at apex; pubescence black, more or less pallid on cheeks and sides of metathorax, and tubercles with a dense pale fringe; clypeus prominent, with sparse strong punctures and (toward base) much smaller ones, and a median depression; fringe below clypeus wholly dark; mesothorax moderately shining, distinctly and rather closely punctured, more sparsely on the disc posteriorly; scutellum bigibbous, with minute punctures, and scattered larger ones; area of metathorax rather strongly obliquely ridged, with a thickened margin interrupted in middle, much as in *arciferus*. Legs with dark hair; tegulæ black. Wings dilute fuliginous, nervures and the rather small stigma very dark reddish; second s.m. very broad; first r. n. meeting second t.-c.; second r. n. and third t.-c. thin. First two abdominal segments distinctly but not very densely punctured; apex with black hair.

*Hab.* Stradbroke Island, Queensland, Oct. 2, 1911 (*H. Hacher*, Queensl. Mus. 21).

*Parasphcodes noachinus*, sp. n.

♀.—Length 11 mm., expanse about  $20\frac{1}{2}$ .

Black (including the legs), flagellum with the apical half very obscurely reddish beneath; hair of head and thorax pale grey, with much black on face, front, vertex, mesothorax, and scutellum; clypeus longitudinally grooved, with very strong punctures, and some small ones; front and vertex shining; mesothorax shining, but not brilliantly, strongly but not very densely punctured, quite sparsely at sides of middle; scutellum bigibbous, shining, and sparsely punctured; area of metathorax delicately obliquely striate, the



hind margin swollen and obtuse, interrupted in middle. Legs with dull white hair, dark fuscous on outer side of middle and hind tibiae; hind spur simple; tegulae black. Wings dilute brownish, stigma and nervures very dark reddish brown; second s.m. broad, about square; first r. n. joining second t.-c.; outer nervures thin but dark. Abdomen shining, finely punctured, the hind margins of the segments broadly smooth and impunctate; the first segment has a smooth impunctate area on each side; hair at apex black, of venter white to end of fourth segment; the second abdominal segment is very finely white-ciliate at extreme base.

*Hab.* Ararat, Victoria (*W. F. Hill*; N. Mus. Vict. 78, 80). Two specimens.

*Parasphecodes dissimulator*, sp. n.

♀.—Length about 11 mm.

Black, including legs; flagellum rather bright ferruginous at apex; clypeus shining, sparsely and irregularly punctured, with a median sulcus; front roughened, hardly shining; hair of head and thorax dull white, mixed with fuscous on front of head, and to some extent on disc of thorax; mesothorax densely punctured, shining between the punctures; scutellum flattened, closely punctured, not bigibbous; area of metathorax of the same type as in *P. noachinus*, but the striae very feeble. Legs with rather more dark hair than in *P. noachinus*, the hind tibiae with a band of red-brown hair on outer side, hind basitarsus with a brush of red hair at end; tegulae rufo-piceous. Wings strongly dusky, nervures and stigma ferruginous; second s.m. broad, receiving first r. n. at its apical corner. Abdomen nearly as in the allied species, the punctures on second segment small and not at all dense; hair at apex black, of venter pale; second ventral segment with a slight elevation.

*Hab.* One specimen labelled Carrom, Victoria (*French*; Froggatt coll. 176).

*Parasphecodes atrorufescens*, sp. n.

♀.—Length 10 mm.

Robust, black, with the first three abdominal segments very dark red; flagellum black, very faintly reddish at end; clypeus shining, with a slender median groove and sparse only moderately large punctures; front dullish, granular, but shining below middle ocellus; hair of head and thorax as in *P. dissimulator*; mesothorax densely, rather coarsely

punctured; scutellum slightly bigibbous, with small well-separated punctures on a shining surface; base of metathorax of the same type as that of *P. noachinus*. Legs with much dark hair, covering outer side of middle and hind tibiae and tarsi; brush at apex of hind basitarsi dark; tegulae black. Wings dusky, very strongly so apically; stigma and nervures piceous; second s.m. very broad, receiving first r. n. well before its end. Abdomen shining, the first two segments finely punctured, the first more closely than the second; hair at apex black; of venter, to end of fourth segment, glistening silvery; second ventral segment with a very large tubercle, the posterior slope of which is beset with silvery hairs.

*Hab.* Purnong (*S. W. Fulton*; Nat. Mus. Victoria, 138).

*Andrena bateia*, Cockerell.

*Andrena batesia*, Cockerell, Trans. Am. Ent. Soc. xxxvi. p. 248. Cyprus.

Following, I believe, an erroneous label, I wrote *batesia*, and the collector's name Miss Bates, although I ought to have known better, being well aware of the brilliant work of Miss Dorothea Bate in Cyprus.

*Cœlixys ducalis*, Smith.

Professor C. F. Baker sends me this fine species, collected by himself at Los Baños, Philippine Islands. At the same locality he has also taken both sexes of *C. philippensis*, Bingham.

*Xylocopa morio callichlora*, Cockerell, variety *a*.

Apical half of anterior wings suffused with coppery red. Three females; Guayaquil, Ecuador, May to June, 1913 (*C. T. Brues*). *X. callichlora* probably deserves to rank as a distinct species.

#### XIV.—*Descriptions of new Genera and Species of Noctuidæ.*

By Sir GEORGE F. HAMPSON, Bart., F.Z.S.

[Continued from vol. xii. p. 601.]

##### *CUCULLIANÆ.*

2122 b. *Cucullia nubipicta*, sp. n.

♂. Head and thorax blue-grey mixed with fuscous brown; tegulae with two dark lines at middle and one near tips; palpi with blackish streaks at sides except towards tip; pectus whitish tinged with red-brown; abdomen grey tinged

with dark brown, the ventral surface whitish tinged with red-brown. Fore wing blue-grey irrorated with blackish; a slight blackish streak on costa towards base; antemedial line blackish, diffused to submedian fold, then slight, strongly angled inwards on vein 1 and outwards above inner margin, the inner area beyond it tinged with fuscous; a slight black point in upper part of middle of cell; reniform hardly traceable, with slight black streak above and minute black points on inner and outer sides above, a small black spot above it on costa with the indistinct dark postmedial line arising from it, strongly bent outwards below costa, then waved, very oblique below vein 4 and angled inwards in submedian fold to near the antemedial line, then outwards at vein 1; the costal area tinged with fuscous towards apex; subterminal line very indistinct, dark, incurved below vein 4, some dark suffusion beyond it at discal fold and below vein 2; a terminal series of black striæ. Hind wing semi-hyaline white, the veins tinged with brown especially towards termen; the underside with the costa irrorated with brown except towards base.

*Hab.* BR. E. AFRICA, Aberdare Mts., 8000' (*Neave*), 1 ♂ type. *Exp.* 44 mm.

2188 *b.* *Callierges peruviana*, sp. n.

Antennæ of male with the apical part simple; the branches long on inner side, very short on outer.

♂. Head white and dark brown; antennæ dark brown; thorax blue-grey mixed with dark brown, the tegulæ with white line near tips, which are black-brown; tarsi black-brown ringed with white; abdomen grey dorsally suffused with dark reddish brown, ventrally irrorated with brown. Fore wing blue-grey irrorated with dark brown and striated with black, the medial area suffused with dark brown extending obliquely to costa near apex; a curved black streak below base of cell; antemedial line absent; claviform large, defined by black; orbicular grey irrorated with brown and defined by black except above, extending to below the cell; reniform grey irrorated with brown and defined by black except on upper part of outer side, rather rounded; postmedial line black, oblique to vein 6, then inwardly oblique, strongly dentate and incurved in submedian interspace to near the claviform; subterminal line represented by a dark shade between veins 7 and 4 and an oblique black streak from above vein 2 to submedian fold; a fine dark line expanding into spots at the interspaces; a fine white line at base of cilia. Hind wing white, the marginal areas suffused with reddish brown, the veins black-brown; a small black

discoidal spot ; cilia with a brown line through them ; the underside with the costal area irrorated with brown, a post-medial series of short black streaks on the veins.

*Hab.* PERU, Acopampa (*Watkins*), 1 ♂ type. *Exp.* 34 mm.

2378 a. *Derthisa hæmapasta*, sp. n.

♀. Head and thorax ochreous white faintly tinged with rufous, the metathorax rufous at extremity ; antennæ brownish ; palpi brown at base ; abdomen ochreous white tinged with brown, the anal tuft rufous. Fore wing ochreous white tinged with rufous ; the basal area suffused with blood-red and with a slight dark streak above inner margin ; subbasal line represented by black striæ from costa and cell ; antemedial line blackish, obliquely excurved and slightly sinuous ; the cell and area before the postmedial line from costa to vein 2 suffused with blood-red ; orbicular and reniform ochreous white with some blood-red in centres, defined at sides by blackish, the former rounded and conjoined to a similar spot on and below median nervure, the latter constricted at middle and extending to well below the cell ; postmedial line blackish, oblique to vein 7, then somewhat dentate, slightly incurved at discal fold and strongly below vein 3 ; subterminal line whitish, defined on inner side by blood-red towards costa, excurved below vein 7 and at middle, incurved and slightly waved below vein 4 ; a terminal series of small dark brown lunules ; cilia dark brown at tips. Hind wing uniform ochreous white.

*Hab.* TRIPOLI, Cyrene (*Stadden*), 1 ♀ type. *Exp.* 36 mm.

2688 a. *Amathes tripolensis*, sp. n.

♂. Head and thorax purplish red-brown mixed with some grey ; palpi and sides of frons black-brown ; pectus except in frons and hind legs whitish tinged with red-brown ; abdomen whitish suffused with ochreous brown. Fore wing bright purplish red-brown slightly irrorated with dark scales ; antemedial line slight, dark, excurved below costa, then indistinctly double filled in with whitish and obliquely excurved ; orbicular an oblique dark bar ; reniform a blackish-brown lunule ; postmedial line indistinctly double, dark filled in with whitish, somewhat excurved to vein 4, then incurved ; subterminal line represented by a series of minute dark spots in the interspaces, slightly excurved below vein 7 ; a terminal series of small dark spots. Hind wing white faintly tinged with brown ; a small blackish discoidal spot, diffused dark

subterminal line and slight terminal line; the underside with the costal area tinged with red-brown, some dark points on termen towards apex.

*Hab.* TRIPOLI, Cyrene (*Sladden*), 1 ♂ type. *Exp.* 38 mm.

ACRONYCTINÆ.

2867 a. *Trachea normalis*, sp. n.

♂. Head and thorax pale reddish brown mixed with fuscous; tarsi blackish ringed with white; abdomen ochreous tinged with brown. Fore wing ochreous thickly irrorated with brown and blackish; subbasal line represented by double black striæ from costa and cell, some black beyond it below the costa; antemedial line black defined on inner side by ochreous, curved, waved; claviform defined by rather diffused black, short; orbicular and reniform defined by black, the former round, the latter open above and with slight black streaks beyond it above and below vein 6; medial line represented by a small black spot on the costa and diffused line from lower angle of cell to inner margin; postmedial line black, double at costa, bent outwards below costa, then dentate, incurved below vein 4, the costa beyond it blackish with some pale points; subterminal line blackish, slightly angled outwards at vein 7 and excurved at veins 4, 3; a terminal series of small black lunules; cilia with a black line at middle. Hind wing white, the termen tinged with brown; a dark terminal line; cilia white mixed with brown; the underside with the costal and terminal areas irrorated with brown, a small blackish discoidal spot and postmedial line excurved below the costa.

*Hab.* TRANSVAAL, Pretoria (*Zutrencka*), 1 ♂ type. *Exp.* 38 mm.

2876 a. *Trachea leucura*, sp. n.

Abdomen of male with very large white genital tufts; both wings on underside slightly clothed with ferruginous hair and scales to beyond middle.

♂. Head, thorax, and abdomen cupreous red-brown, the last with very large white genital tuft of hair; tarsi dark brown ringed with white. Fore wing cupreous red-brown; a white point at base of cell and small subbasal spots below costa and cell, the lower with a dark streak beyond it in submedian fold to below origin of vein 2; small antemedial white spots below costa and in submedian fold; orbicular represented by three white points with a dark streak beyond them to the reniform, which is defined by seven white points;

a small white spot on costa above end of cell with some points beyond it ; a small postmedial spot on inner margin ; small subterminal white spots below costa, on vein 4 and above tornus with white points on slight dark marks between them ; a fine terminal dark line with white points at the veins and a fine white line at base of cilia. Hind wing pale cupreous brown ; a fine dark terminal line and whitish line at base of cilia. Underside of both wings with the basal half suffused with rufous ; fore wing with dark postmedial line slightly excurved at middle ; hind wing with dark discoidal lunule, postmedial line and traces of subterminal line towards costa.

*Hab.* GOLD COAST, Bibianaha (*Spurrell*), 1 ♂ type. *Exp.* 36 mm.

2878 a. *Trachea phœnicolopha*, sp. n.

♂. Head and thorax red-brown, the prothoracic crest with some white at tips, the patagia with some white scales ; antennæ blackish ; pectus and legs rufous, the tarsi blackish ringed with white ; abdomen bright rufous with some whitish at base, the lateral tufts from base of abdomen deep purple-red. Fore wing bright red-brown suffused in parts with dark brown ; a small tuft of white scales at base of vein 1 ; subbasal line double, black filled in with pure white, waved, from costa to vein 1 ; antemedial line indistinct, double, dark, waved, with small pure white spots on it at and below costa, in submedian fold, and on vein 1 ; orbicular with white spot at middle and four white spots defined by blackish at its angles ; reniform with white spot in upper part, irregular spot in lower part, lunule at middle of outer edge, and seven small white spots in its circumference, all defined by blackish ; postmedial line indistinctly double, dark, filled in with white at and below costa and towards inner margin, bent outwards below costa, then slightly waved, incurved at discal fold and oblique below vein 4, some white points beyond it on costa ; subterminal line with a bifid white spot at costa, then represented by a series of minute white spots defined on inner side by dentate blackish marks, oblique below vein 3 ; a fine black terminal line with white points at the veins. Hind wing whitish suffused with red-brown, especially on terminal area ; a fine dark terminal line ; the underside whiter, a dark discoidal lunule, crenulate postmedial line from costa to vein 2, and dark subterminal shade from costa to vein 4.

*Hab.* LORENZO MARQUES, 1 ♂ type. *Exp.* 36 mm.

3105 a. *Perigea gypsina*, sp. n.

♀. Head and tegulæ rufous mixed with whitish, the latter with slight rufous medial line and blackish tips; antennæ ringed brown and whitish towards base; thorax and abdomen white; legs suffused with rufous, the fore tarsi blackish with pale rings. Fore wing white; some pale rufous on base of costa and below the cell; an oblique wedge-shaped rufous antemedial patch from costa to median nervure with traces of an oblique sinuous line from it to inner margin; orbicular and reniform represented by confluent white patches, the former with curved rufous mark below it and rufous above it on costa; a rufous striga defined on each side by white from middle of costa; an oblique wedge-shaped postmedial patch from costa to vein 2, above which it is connected with the termen by a diffused fascia; postmedial line indistinct and dark on the rufous area, then almost obsolete, bent outwards below costa, then dentate and produced to a double series of blackish points with whitish points between them, some white points beyond it on costa; an oblique wedge-shaped rufous patch from termen below apex and a terminal series of black points. Hind wing white suffused with brown except at base and on inner area, darker towards termen; a terminal series of blackish striæ defined on inner side by white; cilia white, brown towards apex; the underside white, the costal area and terminal area to vein 2 irrorated with pale rufous, a bright rufous apical patch and terminal series of small black lunules from apex to vein 2.

*Hab.* GOLD COAST, Kumasi (*Sanders*), 1 ♀ type. *Exp.* 40 mm.

3141 a. *Perigea cupricolora*, sp. n.

♂. Head and thorax cupreous red slightly mixed with blackish; palpi with some black at side; tarsi blackish with pale rings; abdomen grey-brown, the ventral surface red-brown. Fore wing cupreous red-brown, the base and costal half to the postmedial line with some fuscous suffusion, the veins with dark streaks; subbasal line represented by two dark striæ from costa; antemedial line very indistinct, double, waved; claviform a minute black spot; orbicular very faintly defined by brown; reniform very faintly defined by brown and some black points, irregular, extending to below the cell; an oblique sinuous line from lower angle of cell to inner margin; postmedial line dark, slightly waved, excurved to vein 4, then incurved, a series of minute black

points beyond it on the veins; subterminal line blackish, waved, excurved below vein 7 and at middle; a fine black terminal line and pale line at base of cilia. Hind wing whitish suffused with brown especially on terminal area; cilia whitish tinged with rufous; the underside brownish white, the costal area suffused with rufous, a dark discoidal bar and postmedial line except on inner area.

*Hab.* BR. E. AFRICA, Nairobi (*Anderson*), 1 ♂ type. *Exp.* 34 mm.

3144 *a.* *Perigea violascens*, sp. n.

♀. Head and thorax dark brown mixed with purple-grey; tarsi blackish with pale rings; abdomen grey suffused with fuscous brown, the crests blackish. Fore wing dark brown thickly irrorated with purple-grey and with a slight cupreous gloss; antemedial line blackish defined on inner side by grey, double at costa, sinuous, incurved at vein 1; orbicular and reniform with grey annuli, the former small, round, the latter figure-of-eight shaped; an indistinct sinuous dark medial line; postmedial line blackish defined on outer side by grey, dentate and produced to short streaks on the veins, excurved to vein 4, then incurved, some white points beyond it on costa; subterminal line purple-grey defined on inner side by dark brown suffusion, excurved below vein 7 and at middle; a terminal series of grey points. Hind wing dark brown with a cupreous gloss; a terminal series of black striæ with whitish points at the veins; the underside blue-grey thickly irrorated with brown, an indistinct diffused curved postmedial line from costa to vein 2 and faint subterminal shade.

*Hab.* C. CHINA, Chungking (*W. R. Brown*), 1 ♀ type. *Exp.* 30 mm.

3182 *a.* *Oligia hypoxantha*, sp. n.

Mid and hind coxæ of male with large tufts of black-brown hair; abdomen with tuft of reddish-ochreous hair on ventral surface towards extremity; wings on underside clothed with ochreous androconia to near termen.

Head and thorax red-brown mixed with ochreous white; palpi with the second joint whitish at extremity; abdomen brown mixed with ochreous white, the ventral surface ochreous. Fore wing dark red-brown mixed with pale ochreous; antemedial line indistinct, double, brown filled in with ochreous, sinuous; orbicular and reniform with slight ochreous annuli defined by black, the former round; an indistinct sinuous brown medial line; postmedial line indistinct,



brown, bent outwards below costa, slightly incurved at discal fold and incurved below vein 4; subterminal line indistinct, brown, slightly excurved below vein 7 and at middle; a terminal series of dark points. Hind wing reddish brown. Underside of both wings clothed with ochreous androconia, the terminal areas brown mixed with whitish; fore wing with slight dark postmedial line excurved below costa; hind wing with black discoidal point.

*Hab.* GOLD COAST, Bibianaha (*Spurrell*), 1 ♂ type; S. NIGERIA, Olokemeji (*Dudgeon*), 1 ♂, 4 ♀. *Exp.* 24–26 mm.

3182 b. *Oligia atrivitta*, sp. n.

Femora of male with tufts of hair; fore wing with the retinaculum formed by a fringe of scales; hind wing on underside with the basal half of costal area and the cell thickly clothed with rufous scales.

♂. Head reddish ochreous, the frons with blackish bars at middle and above; antennæ brown; palpi black-brown, whitish in front; thorax and abdomen black-brown, the tegulæ edged with reddish ochreous; pectus and legs reddish ochreous, the tufts of hair on femora black, the tibiæ and tarsi banded with blackish. Fore wing with the basal and postmedial areas reddish ochreous irrorated with brown, the antemedial, medial, and terminal areas dark brown; sub-basal line blackish, curved, from costa to vein 1; antemedial line blackish, curved; orbicular with blackish outline, round; reniform an ill-defined ochreous patch extending to costa and defined by black on inner side; an oblique black patch from the cell below the orbicular to the postmedial line, which is indistinct, double, excurved and minutely waved to vein 2 where it is angled inwards, then oblique to inner margin, some blue-grey beyond it on inner area; sub-terminal line only defined by the dark terminal area, excurved at vein 7 and middle; a black terminal line and fine pale line at base of cilia. Hind wing dark brown; some ochreous at base; a fine pale line at base of cilia. Underside of fore wing with the fringe of scales on basal costal area bright rufous; hind wing with the rough scales on costal area and in cell bright rufous.

♀. Fore wing with the basal and postmedial areas browner; the underside without rufous.

Ab. 1. ♀. Fore wing with the basal and postmedial areas more prominently reddish ochreous, the patch on inner area beyond the postmedial line pale ochreous.

*Hab.* GOLD COAST, Bibianaha (*Spurrell*), 1 ♂, 2 ♀ type. *Exp.* 16–20 mm.

3414 a. *Eriopus argyrosema*, sp. n.

♀. Head and thorax bright rufous; antennæ dark brown; pectus greyish; abdomen grey-brown, the basal crest rufous. Fore wing bright rufous; two slight oblique whitish subbasal lines from costa to median nervure; antemedial line almost medial, brown defined on inner side by whitish, inwardly oblique and almost straight; orbicular represented by a slight inwardly oblique whitish striga defined on outer side by dark brown; reniform an oblique silvery-white Y-shaped mark defined at sides by black; a faint diffused oblique brown line from lower angle of cell to inner margin; postmedial line brown, oblique and faintly defined on outer side by whitish below vein 4, an indistinct diffused brown line beyond it; subterminal line silvery white defined on each side by dark brown and incurved from costa to below vein 5 and with traces of a fine waved white line beyond it, then obsolete. Hind wing grey-brown; cilia rufous at base, whitish at tips; the underside pale grey, the costal area suffused with rufous, a dark discoidal bar and postmedial line waved towards costa.

*Hab.* PERU, Chanchamayo, 1 ♀ type. *Exp.* 26 mm.

3429 a. *Eriopus pyrocauta*, sp. n.

♀. Head and thorax red-brown suffused with grey-white; antennæ dark brown; tarsi brown ringed with white; abdomen pale grey-brown, the crest on third segment fiery red. Fore wing red-brown suffused with fiery red and slightly irrorated with whitish, the terminal area tinged with blue-grey; antemedial line very indistinct, whitish, excurved to submedian fold and angled inwards at vein 1; minute white spots in middle of cell and at lower angle; postmedial line indistinct, whitish faintly defined on each side by brown, oblique to vein 4, then inwardly oblique, some minute white points beyond it on costa; a very slight oblique somewhat sinuous bluish-white subterminal line from vein 4 to inner margin; a fine white line at base of cilia. Hind wing red-brown, the inner area fiery red; a fine white line at base of cilia; the underside bluish white suffused with brown.

*Hab.* FR. GUIANA, St. Laurent Maroni, 1 ♀ type. *Exp.* 18 mm.

3492 a. *Chytonyx albiplaga*, sp. n.

♂. Head and thorax fuscous brown mixed with white and some ochreous; tarsi ringed with white; abdomen ochreous

mixed with fuscous brown, the crests black at tips. Fore wing reddish ochreous suffused with fuscous brown, the inner half of medial area white from just above median nervure; traces of a double dark sinuous subbasal line from costa to submedian fold; antemedial line very indistinct, dark, excurved below costa and angled inwards at vein 1; orbicular large, rather triangular, white, conjoined to the white inner area; reniform with obscure ochreous annulus, its centre defined by fuscous brown; postmedial line indistinct, dark, minutely dentate, excurved from below costa to vein 4, then incurved, and oblique from vein 3 to inner margin towards tornus; faint traces of a minutely waved dark subterminal line; a terminal series of minute blackish spots. Hind wing ochreous whitish tinged with brown, the veins and terminal area rather darker; a diffused dark discoidal spot; cilia whitish; the underside ochreous whitish slightly irrorated with brown, a large blackish discoidal spot, traces of a waved postmedial line and a black terminal line lunulate on costal half.

*Hab.* FORMOSA (*Elwes*), 1 ♂ type. *Exp.* 32 mm.

3505 a. *Bryophila fulvisparsa*, sp. n.

♂. Head, thorax, and abdomen white mixed with black and some fulvous; antennæ black; palpi black at sides except towards tips; pectus and legs white mixed with brown, the tarsi black ringed with white; ventral surface of abdomen white with slight blackish segmental lines towards extremity. Fore wing grey-white thickly irrorated with blackish and some fulvous, the ante- and postmedial areas with more fulvous; the basal costal area with some black suffusion defined by the indistinct sinuous subbasal line from costa to submedian fold; antemedial line black defined on inner side by whitish, sinuous; orbicular and reniform with whitish annuli, the former small, round, the latter indistinct; postmedial line black defined on outer side by whitish, waved, excurved from costa to vein 3, then strongly incurved, some whitish points beyond it on costa; traces of a sinuous dark subterminal line excurved below vein 7 and at middle; a terminal series of black striæ; cilia chequered dark and white. Hind wing white irrorated with fuscous brown; a small fuscous discoidal spot, obliquely curved postmedial line, and faint diffused subterminal shade; the underside with blackish discoidal lunule and waved curved postmedial line.

*Hab.* U.S.A., Utah, Eureka (*Spalding*), 2 ♂ type. *Exp.* 30 mm.

3527 a. *Bryophila anæmica*, sp. n.

♂. Head and thorax white tinged with brown and irrorated with a few blackish scales; antennæ blackish; palpi with some black at side of second joint; tarsi black ringed with white; abdomen white tinged with fuscous, the crests blackish. Fore wing white tinged with brown and in parts with yellowish and slightly irrorated with blackish; a black streak below submedian fold from base to the antemedial line and between the ante- and postmedial lines; a slight blackish subbasal streak in the cell; antemedial line indistinct, blackish, angled outwards below the costa and submedian fold and inwards below the cell and at vein 1; orbicular and reniform small brownish spots with faint whitish annuli; postmedial line very indistinct, blackish, bent outwards below costa and oblique from vein 4 to submedian fold; traces of an oblique subterminal line with short black streaks beyond it above and below vein 5 and below vein 2; a terminal series of minute black spots; cilia with series of blackish spots at middle and tips. Hind wing white tinged with reddish brown; cilia white with a brownish line near base; the underside with slight brownish discoidal spot and sinuous postmedial line excurved below the costa.

*Hab.* ALGERIA, Batna (*Eaton*), 1 ♂ type. *Exp.* 26 mm.

3700 a. *Acronycta lilacina*, sp. n.

♀. Head and thorax purple-grey mixed with dark brown; palpi with the first and second joints black except at tips; tarsi dark brown with pale rings; abdomen grey suffused with brown. Fore wing purple-grey mixed with dark brown; an indistinct curved blackish subbasal line from costa to median nervure; a black streak in submedian fold from base to the antemedial line towards which it forks; antemedial line dark, indistinct except at costa, oblique, sinuous, angled inwards below the cell and slightly at vein 1; some rufous beyond it below the cell; orbicular and reniform absent; a black streak above terminal part of median nervure to just beyond the cell, with a slight streak below its extremity and some diffused rufous beyond the cell; a dark shade from costa to upper angle of cell; postmedial line black defined on inner side by pale grey, dentate, strongly excurved below costa, angled inwards at discal fold and strongly in submedian fold, some white points beyond it on costa and a wedge-shaped dark shade from before it to termen in submedian fold; a terminal series of lunulate blackish spots;

cilia whitish mixed with brown. Hind wing whitish suffused with brown; cilia whitish with a blackish line through them; the underside grey irrorated with dark brown, a slight dark discoidal spot, rather diffused waved postmedial line indistinct except towards costa, and faint subterminal shade.

*Hab.* C. CHINA, [Chungking (W. R. Brown), 1 ♀ type. *Exp.* 30 mm.

3880 a. *Lophotarsia minuta*, sp. n.

Head and thorax grey-brown; antennæ blackish; tarsi black ringed with white; abdomen grey-brown suffused with black, the anal tuft ochreous. Fore wing reddish brown suffused with fuscous and irrorated with grey; traces of a curved dark antemedial line; the orbicular and reniform represented by some grey scales; faint traces of a curved postmedial line; subterminal line represented by some minute blackish streaks in the interspaces; a terminal series of black points. Hind wing pure white, the costa tinged with brown towards apex; the underside with the costal area irrorated with brown, a terminal series of dark points except towards tornus.

*Hab.* N. NIGERIA, Minna (Macfie), 1 ♂, 1 ♀ type. *Exp.* 20 mm.

3913 a. *Amphidrina melanosema*, sp. n.

♀. Head and thorax white tinged with rufous; palpi pale rufous with some blackish at sides; legs pale rufous, the fore tibiæ black, the tarsi black with pale rings; abdomen greyish tinged with rufous and irrorated with blackish. Fore wing pale purplish grey tinged in parts with rufous and irrorated with blackish; antemedial line indistinct, double, blackish, oblique and slightly sinuous; orbicular a minute black spot defined by whitish; reniform black with whitish annulus, produced at lower extremity, a blackish patch above it on costa; postmedial line double, black filled in with whitish, oblique to vein 6 and slightly incurved below vein 4; a terminal series of minute black lunules. Hind wing fuscous brown with a cupreous gloss; cilia whitish tinged with brown; the underside grey-white irrorated with blackish, a small black discoidal spot and curved postmedial line.

*Hab.* LORENZO MARQUES, 1 ♀ type. *Exp.* 34 mm.

3933 a. *Athetis atrispherica*, sp. n.

♂. Head and thorax red-brown; antennæ with dark rings; palpi black at sides except at tips; tarsi black ringed

with white; abdomen grey suffused with dark brown. Fore wing glossy red-brown tinged with grey and with slight dark irroration; subbasal line indistinctly double, blackish, from costa to submedian fold, antemedial line double, blackish, slightly angled outwards at subcostal nervure, then sinuous; orbicular a black point with whitish annulus; reniform oblique elliptical, velvety black with slight whitish annulus; a sinuous blackish medial line; postmedial line black, excurved from below costa to vein 4, then incurved, a series of black points beyond it on the veins and some pale points on the costa; subterminal line blackish slightly defined on outer side by whitish, somewhat excurved below vein 7; a terminal series of black points and a fine whitish line at base of cilia. Hind wing reddish brown; a small blackish discoidal spot; a fine pale line at base of cilia; the underside whitish tinged and irrorated with brown, a small discoidal spot and rather diffused curved postmedial line.

*Hab.* BR. E. AFRICA, Nairobi (*Anderson*), 2 ♂ type.  
*Exp.* 32 mm.

3992. *Athetis melanopis*, Hmps., nec 3917.

Rename *A. melanosema*.

4174 a. *Monodes discisigna*, sp. n.

♂. Head and thorax ochreous mixed with brown; antennæ ringed with blackish; palpi with some black at sides; fore and mid tibiae and tarsi streaked with black; abdomen ochreous suffused with brown, the basal crest black at tip, the anal tuft rufous. Fore wing ochreous suffused in parts with rufous and irrorated with blackish, the area beyond the cell suffused with darker brown between veins 5 and 2; the interspaces of terminal area with slight dark streaks except towards apex and tornus; subbasal line represented by two blackish strigæ from costa and two black points below the cell; antemedial line represented by a blackish striga from costa and small black spot below origin of vein 2; the terminal part of median nervure streaked with white; a diffused black-brown spot in middle of cell and round blackish patch beyond the cell; postmedial line represented by a series of blackish points, oblique to the patch beyond the cell, then incurved and with small black spot below vein 2, some slight black streaks beyond it on costa; subterminal line represented by a series of minute blackish spots, excurved below vein 7, then oblique; a terminal series of black points; cilia with series of blackish points at middle and tips. Hind wing white tinged with red-brown especially

on apical part of terminal area ; the underside with the costal and terminal areas irrorated with brown.

*Hab.* JAMAICA, Cinchona (*Kaye*), 1 ♂ type. *Exp.* 28 mm.

4211 a. *Monodes streptisema*, sp. n.

♂. Head, thorax, and abdomen yellow mixed with pale red-brown ; antennæ blackish ; palpi blackish with the extremities of the second and third joints white ; tarsi ringed with white ; abdomen with some white at base of dorsum. Fore wing yellow mixed with red-brown ; subbasal line white defined at sides by black scales, angled inwards at median nervure and ending at vein 1 ; an oblique blackish shade from submedian fold to inner margin before the antemedial line, which is white defined at sides by some black scales, angled outwards below costa and submedian fold and inwards in the cell ; orbicular white defined by black, small, round ; reniform defined by black except above, its upper part yellowish, its lower part white, constricted at middle ; postmedial line white defined at sides by red-brown, forming a small spot at costa, bent outwards below the costa and touching the upper part of reniform, then minutely waved, some white points beyond it on the costa ; subterminal line yellowish defined on each side by diffused red-brown, forming an oblique bar from costa to discal fold where it is interrupted, then forming an almost terminal band ; a terminal series of black points. Hind wing red-brown with a cupreous gloss ; cilia whitish with a red-brown line through them ; the underside whitish irrorated with brown especially on costal area, a small brown discoidal spot and postmedial line slightly waved towards costa.

*Hab.* N.E. PERU, Huancabamba, Cerro del Pasco, 1 ♂ type. *Exp.* 20 mm.

Genus NANAMONODES, nov.

Type, *N. albilinea*.

Proboscis fully developed ; palpi upturned, the second joint reaching to vertex of head and moderately scaled, the third short ; frons smooth ; eyes large, round ; antennæ of male ciliated ; build slender ; thorax clothed almost entirely with scales and without crests ; tibiæ smoothly scaled ; abdomen with dorsal crests on basal segments. Fore wing rather long and narrow, the apex rounded, the termen evenly curved and not crenulate ; veins 3 and 5 from near angle of cell ; 6 from upper angle ; 7 and 9 absent ; 10, 11 from cell. Hind wing with veins 3, 4 coincident ; 5 obsolescent from middle of discocellulars ; 6, 7 from upper angle of cell ; 8 anastomosing with the cell near base only.

4307 a. *Nanamonodes albilinea*, sp. n.

♂. Head and thorax brown mixed with grey-white; palpi blackish; tarsi blackish with pale rings; abdomen fuscous brown, the anal tuft whitish, the ventral surface grey. Fore wing grey suffused with brown and irrorated with blackish especially on basal and terminal areas; antemedial line white defined by black scales, almost medial, curved; a black spot at lower angle of cell touching the postmedial line which is white defined by black scales, oblique to discal fold, then inwardly oblique; a dark subterminal shade and a terminal series of minute black spots. Hind wing greyish brown; the underside whitish tinged with brown.

*Hab.* VENEZUELA, 1 ♂ type. *Exp.* 14 mm.

4470 a. *Calymniodes pygmæa*, sp. n.

♀. Head and thorax pale rufous; antennæ dark brown; abdomen grey-brown. Fore wing yellowish suffused with fiery red and slightly irrorated with blackish scales, the postmedial area brownish white shading to brown before the subterminal line; antemedial line whitish defined on outer side by brown, oblique, curving round at inner margin and meeting the postmedial line, which is white defined on inner side by brown and almost evenly excurved; subterminal line whitish defined on inner side by rather diffused brown, angled outwards at vein 6 and excurved at middle. Hind wing grey-brown; cilia with a fine white line at base; the underside whitish suffused with brown especially on terminal area, a dark discoidal spot, and indistinct diffused curved postmedial line.

*Hab.* FR. GUIANA, St. Laurent Maroni, 1 ♀ type. *Exp.* 26 mm.

4531 a. *Closteromorpha cupreiplaga*, sp. n.

*Closteromorpha reniplaga*, Hmps. Cat. Lep. Phal. B.M. ix. p. 177, ♀ (nec ♂).

Head, thorax, and abdomen ochreous suffused with bright rufous. Fore wing leaden-grey tinged with rufous, the basal area suffused with rufous except at inner margin; antemedial line very indistinct, blackish, slightly curved inwards to costa and excurved at inner margin; a large cupreous rufous patch faintly defined by blackish, extending on costa from end of cell to apex and down to vein 3, its outer edge excised; traces of a dark incurved postmedial line from the patch to inner margin; a terminal series of



slight blackish lunules and more prominent spot at submedian fold. Hind wing brown with a cupreous-red tinge. Underside of both wings brownish with a cupreous-red tinge.

*Hab.* BR. GUIANA, Demerara (*Rodway*), 1 ♀ type; FR. GUIANA, St. Laurent Maroni, ♂ in U.S. Nat. Mus. *Exp.* 34 mm.

4556 a. *Calymnia monotona*, sp. n.

♀. Head and thorax reddish brown mixed with grey; antennæ blackish with slight pale rings; palpi blackish; tarsi blackish ringed with white; abdomen blackish brown. Fore wing grey tinged with red-brown and thickly irrorated with dark brown; subbasal line blackish, sinuous, from costa to submedian fold; antemedial line blackish defined on inner side by grey, oblique towards costa, then slightly sinuous; a faint curved dark medial shade; postmedial line blackish defined on outer side by grey, excurved to vein 6, then slightly sinuous, some slight dark streaks and pale striæ beyond it on costa; subterminal line grey defined on inner side by rather diffused blackish, very slightly excurved at vein 7 and incurved at submedian fold; a terminal series of black striæ and fine pale line at base of cilia. Hind wing pale reddish brown; a terminal series of slight blackish striæ and slight pale line at base of cilia; the underside whitish thickly irrorated with brown, a small discoidal spot and rather diffused curved postmedial line.

*Hab.* BR. E. AFRICA, Nairobi (*Anderson*), 1 ♀ type. *Exp.* 32 mm.

4674 a. *Busseola hemiphlebia*, sp. n.

♂. Head and thorax red-brown mixed with blackish; palpi and legs black-brown, the tarsi ringed with white; abdomen greyish brown. Fore wing pale reddish brown irrorated with fuscous; a darker fascia along median nervure expanding beyond the cell to termen below apex and tornus; the veins of costal half with fine grey streaks; a slight black streak in basal half of submedian fold; white points defined by a few black scales in and beyond lower angle of cell; a curved postmedial series of slight black points; an oblique subterminal series of slight blackish marks in the interspaces from below vein 7 to above 3; a terminal series of black points. Hind wing brown with a cupreous gloss; a fine dark terminal line; cilia whitish tinged with brown; the underside whitish suffused with brown, the costal area darker.

*Hab.* N. NIGERIA, Kateregi (*Macfie*), 1 ♂ type. *Exp.* 26 mm.

4675 a. *Busseola mesophaea*, sp. n.

Head, thorax, and abdomen pale brown mixed with black; pectus, mid and hind legs and ventral surface of abdomen pale brown. Fore wing pale brown irrorated with blackish, the medial area suffused with black; diffused reddish-brown fasciæ in submedian fold and in discal fold beyond the cell; subbasal line black, from costa to submedian fold; antemedial line rather diffused, black defined on inner side by whitish, waved, oblique to submedian fold; orbicular and reniform with indistinct whitish annuli, the former round; in indistinct diffused sinuous black medial line; postmedial line black defined on outer side by whitish, produced to slight streaks on the veins, oblique to vein 5, then incurved; subterminal line formed by small blackish lunules defined on outer side by whitish, angled outwards at vein 7; a terminal series of black striæ and fine pale line at base of cilia. Hind wing white tinged with reddish brown; the underside with small blackish discoidal spot, indistinct postmedial line with minute black streaks at the veins, and terminal series of black striæ.

*Hab.* N. NIGERIA, Minna (*Macfie*), 5 ♂, 1 ♀ type. *Exp.* 26 mm.

4675 b. *Busseola cuprescens*, sp. n.

♂. Head and thorax cupreous brown mixed with ochreous; antennæ, palpi, and legs brown; tarsi ringed with white; abdomen ochreous suffused with brown. Fore wing ochreous suffused with cupreous brown; an antemedial dark point on vein 1; some dark scales beyond lower angle of cell; a slight oblique dark subterminal shade arising from termen below apex. Hind wing white with a very faint brownish tinge; the underside with the costal area more strongly tinged with brown.

*Hab.* N. NIGERIA, Minna (*Macfie*), 2 ♂ type. *Exp.* 20 mm.

4675 c. *Busseola holoscota*, sp. n.

♂. Head, thorax, and abdomen dark brown slightly mixed with grey; tarsi ringed with white. Fore wing dark brown slightly mixed with grey; a very slight black streak in medial part of submedian fold; some reddish at base of inner margin; a white point at lower angle of cell with a few black scales round it. Hind wing dark brown; cilia grey-brown; the underside greyish brown.

*Hab.* N. NIGERIA, Minna (*Macfie*), 2 ♂ type. *Exp.* 22 mm.

4675 d. *Busseola rufidorsata*, sp. n.

♀. Head, thorax, and abdomen dark greyish brown; pectus, legs, and ventral surface of abdomen pale reddish brown, the tarsi fuscous ringed with white. Fore wing dark greyish brown, the area below submedian fold reddish brown; an indistinct reddish-brown streak in discal fold from middle of cell to well beyond the cell where it is met by an oblique reddish brown fascia from apex. Hind wing greyish brown; the underside whitish tinged with brown.

*Hab.* N. NIGERIA, Minna (*Macfie*), 1 ♀ type. *Exp.* 30 mm.

4746 a. *Acrapex stictisema*, sp. n.

♀. Head and thorax grey-brown with a reddish tinge; abdomen grey-brown, the ventral surface tinged with reddish. Fore wing pale grey-brown, the veins of costal and terminal areas with fine grey streaks; a faint flesh-coloured streak in submedian fold; a faint flesh-coloured streak in discal fold from middle of cell to well beyond the cell, where it is met by a faint oblique flesh-coloured fascia from apex; antemedial blackish points on subcostal and median nervures and vein 1; black points in and beyond upper and lower angles of cell; a curved postmedial series of slight black points on veins 7 to 1; a terminal series of prominent black points. Hind wing whitish tinged with brown; a fine blackish terminal line from apex to vein 2; cilia whitish.

*Hab.* DUTCH N. GUINEA, Iwaka R. (*Wollaston*), 1 ♀ type. *Exp.* 40 mm.

4760 a. *Sesamia steniptera*, sp. n.

Fore wing very narrow, the apex produced and the termen oblique.

♂. Head and thorax whitish tinged with grey; antennæ blackish except towards base; palpi, front of pectus, and fore legs blackish; abdomen whitish. Fore wing pale flesh-pink; the costal area tinged with grey to beyond middle; the basal inner area pale grey; a faint oblique subterminal grey shade between veins 6 and 2; cilia pale grey. Hind wing white.

*Hab.* TRANSVAAL, Johannesburg (*Cooke*), 1 ♂ type. *Exp.* 30 mm.

4762 a. *Sesamia fuscifrontia*, sp. n.

♂. Head and thorax ochreous; palpi, frons, and fore legs fuscous brown; mid legs tinged with brown; abdomen

ochreous whitish. Fore wing ochreous slightly irrorated with brown, more thickly on terminal area except towards tornus; the veins faintly streaked with whitish towards apex. Hind wing ochreous white; the underside with the costal area tinged with brown except towards base.

*Hab.* BR. E. AFRICA, N. Kavirondo, Maramas Distr, Ilala (*Neave*), 1 ♂ type. *Exp.* 22 mm.

4767 a. *Sesamia nigritarsis*, sp. n.

♀. Head and thorax ochreous slightly tinged with rufous; palpi with some brown; fore legs fuscous on inner side; mid and hind tibiae with the spurs black except at tips; tarsi black at extremities; abdomen ochreous. Fore wing ochreous slightly tinged with rufous; the median nervure irrorated with black; postmedial black points on veins 6 to 3; a terminal series of black points from below apex to above vein 2. Hind wing pale ochreous suffused with brown except on costal and tornal areas which are slightly irrorated with fuscous; small terminal blackish spots between veins 7 and 2. Underside ochreous irrorated with fuscous; fore wing with the disk suffused with fuscous; hind wing with slight blackish streak in middle of cell, discoidal spot, and terminal series of black striae.

*Hab.* BR. E. AFRICA, Aberdare Mts. (*Neave*), 1 ♀ type. *Exp.* 50 mm.

4776 a. *Conicafrontia scotochroa*, sp. n.

♀. Head and thorax fuscous brown; abdomen dull reddish brown. Fore wing dull reddish brown, tinged with fuscous; a slight dark terminal line and fine pale line at base of cilia. Hind wing white tinged with reddish brown.

*Hab.* TRANSVAAL, Pretoria (*Distant*), 1 ♀ type. *Exp.* 40 mm.

Genus APSARANYCTA, nov.

Type, *A. bryophilina*.

Proboscis aborted, minute; palpi porrect, hardly extending as far as the frons which has a large pointed conical prominence; eyes large, round; antennae of female bipectinated with short branches, the apical half ciliated; thorax clothed almost entirely with scales and without crests; tibiae fringed with rather long hair; abdomen with dorsal crest at base only. Fore wing with the apex rounded, the termen evenly curved and not crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10

anastomosing with 8 to form the areole; 11 from cell. Hind wing with veins 3, 4 from angle of cell; 5 obsolescent from just below middle of discocellulars; 6, 7 from upper angle; 8 anastomosing with the cell near base only.

4782 a. *Apsaranycta bryophilina*, sp. n.

♀. Head and thorax glossy white; palpi, lower part of frons, antennæ, and tegulæ black; pro-, meso-, and meta-thorax with paired black spots; legs black-brown and white; abdomen black, the anal tuft white, the ventral surface black-brown and white. Fore wing glossy white; an oblique black bar from base of costa to vein 1; an oblique antemedial black spot from costa and four obliquely incurved spots from middle of cell to inner margin, with spots beyond them below the cell and above vein 1; a black spot at middle of costa and inverted V-shaped mark on inner margin; a black annulus in cell towards extremity conjoined to a triangular spot from costa and a spot in lower extremity of cell; two points beyond lower angle of cell and an oblique waved line from lower angle to submedian fold; a postmedial spot on costa, series of five spots between vein 6 and submedian fold angled outwards at vein 4, and spot on inner margin; a subterminal series of spots, excurved at middle, then incurved, a triangular patch beyond it from costa with white point at costa, a spot below vein 7, and irregular fascia at vein 2 from it to termen; irregular spots before termen below apex and at middle, and a series of small spots on termen and cilia. Hind wing black-brown, the cilia white mixed with black-brown. Underside of fore wing suffused with black; hind wing blackish with some white defining a discoidal spot, postmedial curved series of whitish marks, and some whitish marks on termen from discal fold to tornus.

*Hab.* BOMBAY, Anshi (*T. R. Bell*), 1 ♀ type. *Exp.* 40 mm.

4808 a. *Callyna contrastans*, sp. n.

♀. Head and thorax fuscous black; pectus white; tibiæ and tarsi banded with orange; abdomen fuscous tinged with blue-grey. Fore wing black; an orange subbasal bar from costa to submedian fold, an antemedial bar from costa to middle of cell, a medial bar from costa to subcostal nervure, two points on postmedial part of costa, and a spot at apex. Hind wing with the basal and inner areas pure white, the rest of wing fuscous black. Underside of fore wing with

some whitish at base, two postmedial points on costa and the apical spot yellow, a terminal series of minute white points; hind wing with the outer edge of the white area irregular.

*Hab.* GOLD COAST, Bibianaha (*Spurrell*), 1 ♂ type. *Exp.* 44 mm.

*ERASTRIANÆ.*

5003 *b.* *Acidaliodes melasticta*, sp. n.

♀. Head, thorax, and abdomen pale grey-brown; the back of head with black point; palpi with some black at side of second joint; fore legs suffused with blackish, the mid and hind legs and ventral surface of abdomen brownish white. Fore wing pale grey-brown; a black point at base of median nervure; subbasal black points below costa and cell; traces of an antemedial line with four black points on it; a black point in middle of cell; a curved medial series of five black points; black points at angles of cell with a slight blackish mark above it on costa; obliquely placed black points on and below costa; traces of a pale subterminal line with black points on its outer edge, excurved below vein 7 and at middle; a fine waved black terminal line with series of prominent black points on it. Hind wing pale grey-brown; a subbasal black point above inner margin; an oblique brownish medial line strongly irrorated with black scales; an indistinct brownish subterminal line with series of small black spots on it, angled inwards at discal fold, then oblique; a fine waved black terminal line with series of prominent black points on it; cilia irrorated with black scales; the underside white slightly tinged with brown.

*Hab.* DUTCH N. GUINEA, Mimika R. (*Wollaston*), 1 ♀ type. *Exp.* 16 mm.

5004 *a.* *Acidaliodes strenualis*, sp. n.

♀. Head, thorax, and abdomen pale red-brown; pectus whitish. Fore wing pale red-brown mixed with some whitish and with slight dark irroration; a deeper red-brown medial shade from discal fold to inner margin; a slight blackish streak in discal fold beyond the cell; postmedial line whitish, slightly defined on inner side by blackish towards costa, very oblique from middle of costa to discal fold towards termen, then inwardly oblique, some darker brown on its outer side towards inner margin and some black striæ beyond it from costa; a series of short black subterminal

streaks defined on outer side by whitish from costa to vein 4, followed by a fine whitish line from discal fold to inner margin. Hind wing pale red-brown irrorated with a few black scales; postmedial line whitish, excurved below costa; a whitish line before termen; the underside whitish tinged with brown, a black discoidal point, medial and postmedial brown lines and a brown subterminal shade, a terminal series of minute dark spots.

*Hab.* BORNEO, Sarawak (*Wallace*), 1 ♀ type. *Exp.* 16 mm.

5020 a. *Aræoptera ecphæa*, sp. n.

♀. Head and thorax white mixed with some brown; antennæ ringed with brown; fore legs blackish; abdomen white dorsally suffused with blackish. Fore wing whitish suffused with red-brown, the costa with alternating minute black and whitish streaks; slight blackish points in and beyond lower angle of cell; subterminal line white defined on outer side by blackish suffusion, oblique from apex to vein 5, excurved at middle; a terminal series of black points. Hind wing whitish suffused and irrorated with black; cilia whitish mixed with brown; the underside whitish tinged with fuscous; obscure diffused oblique antemedial and subterminal blackish shades, a terminal series of blackish points.

*Hab.* S. NIGERIA, Baro (*Simpson*), 1 ♀ type. *Exp.* 10 mm.

5068 a. *Enispa fluvitincta*, sp. n.

♂. Head and thorax brown mixed with grey; pectus and legs white tinged with brown; abdomen white tinged with brown, the basal segment rufous. Fore wing yellowish white, the basal half and costal area to near apex suffused with fuscous brown; some purplish at base and some rufous below the cell before middle and in and beyond end of cell; a small blackish discoidal spot; postmedial line represented by a yellowish lunule beyond the cell and slight lunule below vein 4; subterminal line yellowish white, defined on inner side by slight lunulate fuscous brown marks and on outer side by lunulate fuscous brown marks from costa to vein 3. Hind wing fuscous brown irrorated with silvery scales, the termen pale yellow; cilia yellowish mixed with brown. Underside of fore wing white, tinged with fuscous brown to submedian fold, its outer edge running obliquely

from apex ; hind wing white with a faint fuscous tinge except on marginal areas.

*Hab.* GOLD COAST, Kumasi (*Whiteside*), 1 ♂ type. *Exp.* 16 mm.

5108 a. *Eublemma porphyrescens*, sp. n.

♂. Head and tegulae fuscous brown mixed with grey ; thorax and abdomen pale purplish brown ; pectus and legs whitish, the fore tibiae blackish, the tarsi black ringed with white ; abdomen with the anal tuft blackish, the ventral surface whitish. Fore wing pale purple slightly irrorated with brown ; subbasal line represented by a black spot on costa and point in cell ; antemedial line reddish brown with a black spot on costa, waved ; a slight reddish-brown spot in middle of cell ; the reniform defined by rather diffused reddish brown, narrow ; medial line with black spot at costa, slight and excurved beyond the cell and waved below the cell ; postmedial line reddish brown with a black spot at costa, oblique to vein 6 and incurved below vein 4, some pale points beyond it on costa ; subterminal line black defined on inner side by pale rufous and with blackish suffusion beyond it, somewhat dentate, angled outwards below vein 7 and at middle and inwards at discal fold ; a terminal series of black striae ; cilia pale rufous at base, fuscous at tips. Hind wing whitish, the area along vein 1 except at base and between veins 4 and 2 irrorated with black and rufous ; an indistinct minutely dentate subterminal line, the area beyond it tinged with fuscous except towards tornus ; a black terminal line ; cilia rufous mixed with black, the underside white, the costal and terminal areas faintly tinged with rufous and irrorated with brown.

*Hab.* N. NIGERIA, Zungeru (*Macfie*), 1 ♂ type. *Exp.* 16 mm.

5114 a. *Eublemma postrufa*, sp. n.

♂. Head and thorax grey mixed with fuscous brown ; pectus and legs pale rufous, the fore and mid tibiae fuscous, the tarsi black ringed with white ; abdomen fuscous brown, the ventral surface pale rufous. Fore wing pale purple slightly irrorated with red-brown, the basal area with a greyish tinge, subbasal black spots on costa and in cell ; antemedial line black, expanding into a spot on costa, rather inwardly oblique, waved ; some red-brown scales in middle of cell ; reniform defined by rather diffused red-brown, narrow ; medial line red-brown with black spot at



costa, slight and excurved beyond the cell, waved below it; postmedial line black slightly defined on outer side by grey, expanding into a spot at costa, oblique to vein 6 and below vein 4, incurved at submedian fold; the postmedial area rufous with some blackish on costal area, at middle, and above inner margin; subterminal line black, dentate, the area beyond it rufous with blackish suffusion at apex, and above middle and tornus; a terminal series of black striæ; cilia rufous mixed with blackish. Hind wing with the basal half white with black suffusion between veins 4 and 2 and along vein 1; a black postmedial line obsolete towards costa and at submedian fold; the terminal half rufous; a dentate subterminal line, fuscous on costal half, black on inner half; a terminal series of black striæ; cilia rufous mixed with blackish; the underside whitish, the costal and terminal areas slightly tinged with rufous and irrorated with brown.

*Hab.* BR. E. AFRICA, Nairobi (*Anderson*), 1 ♂ type. *Exp.* 20 mm.

5116 a. *Eublemma atrimedia*, sp. n.

♀. Head, thorax, and abdomen purplish grey irrorated with black; pectus, legs, and ventral surface of abdomen pale grey, the fore and mid tibiæ suffused with black, the tarsi blackish with pale rings. Fore wing purplish grey irrorated with black, the medial area suffused with black; subbasal line black, slightly excurved below costa and ending at submedian fold; antemedial line black, sinuous, expanding into a small spot at costa; a small black spot in middle of cell and discoidal bar; medial line black, expanding into a small spot at costa, excurved beyond the cell, and waved below it; postmedial line black, expanding into a small spot at costa, bent outwards below costa, incurved at discal fold and below vein 4; subterminal line black slightly defined on inner side by grey, forming small dentate marks to discal fold, then waved. Hind wing purplish grey irrorated with fuscous; some black irroration along vein 1 except towards base and obscure blackish medial postmedial and subterminal bars at vein 2.

*Hab.* N. NIGERIA, Zungeru (*Simpson*), 1 ♂ type. *Exp.* 24 mm.

5218 a. *Eublemma mesozona*, sp. n.

♂. Head and tegulæ yellow, the latter brownish towards tips which are white; palpi black above; antennæ blackish; thorax creamy white; legs tinged with brown, the fore legs

blackish in front ; abdomen white tinged with brown. Fore wing creamy white ; the costal edge black towards base ; a small subbasal black spot in cell ; antemedial line absent ; medial line black, slightly excurved below costa, angled outwards in end of cell, then sinuous, closely approximated to the postmedial line and with the area between them brown ; a black spot at lower angle of cell, some creamy white on discocellulars and sometimes a black point at upper angle of cell ; postmedial line blackish, angled inwards at upper angle of cell, excurved just beyond the cell, then sinuous ; two minute black streaks with whitish between on costa at origin of the subterminal line, which is brown, angled outwards at vein 6, and excurved at middle and below the submedian fold ; the termen tinged with brown and with a terminal series of black striae ; cilia ochreous brown. Hind wing creamy white tinged with brown ; a terminal series of minute black lunules from apex to submedian fold : the underside with traces of curved brown subterminal line.

♀. Fore wing wholly tinged with brown and irrorated with a few brown scales, the ante- and postmedial lines browner and rather further apart ; hind wing strongly tinged with brown.

*Hab.* GOLD COAST, Bibianaha (*Spurrell*), 4 ♂, 1 ♀ type.  
*Exp.* 24 mm.

5244a. *Eublemma albivia*, sp. n.

♂. Head and thorax rufous ; antennae dark brown ; pectus and legs whitish irrorated with brown ; abdomen reddish brown mixed with whitish and with whitish segmental lines. Fore wing red-brown pencilled with whitish and darker brown, the costal area whitish to beyond middle ; antemedial line whitish, excurved below costa, then obliquely curved ; a slight dark discoidal spot ; medial line red-brown defined on outer side by white, angled outwards at vein 6 to below apex, then very oblique, met at vein 6 by an oblique white streak from apex ; postmedial line slight black and very oblique to the apical streak, then white, minutely waved and with series of black points on it, closely approximated to the medial line and incurved below vein 4, some white points beyond it on costa ; subterminal line slight, whitish, somewhat waved, excurved below vein 7 and at middle, angled inwards at vein 2 and ending at tornus ; the terminal area tinged with blackish ; a fine black terminal line and white line at base of cilia which have two waved brown lines through them. Hind wing red-brown pencilled

with whitish and darker brown, a rufous patch beyond the cell; an oblique white medial line; postmedial line slight, whitish, minutely dentate and with minute black streaks at the veins; traces of a pale minutely waved subterminal line; a dark terminal line and white line at base of cilia which have waved brown lines through them; the underside white irrorated with brown, an indistinct brown line from lower angle of cell to inner margin, and traces of a waved subterminal line.

*Hab.* GOLD COAST, Kumasi (*Sanders*), 1 ♂ type. *Exp.* 22 mm.

5264 a. *Eublemma melabasis*, sp. n.

♂. Head and tegulæ brownish white; thorax pale grey with some fuscous on outer edge of patagia and extremity of metathorax; pectus and legs whitish, the fore and mid tibiæ fuscous, the tarsi black ringed with white; abdomen brownish white. Fore wing white very finely and thickly striated with brown; the antemedial area suffused with black, bounded by the inwardly oblique black antemedial line; a small diffused black discoidal annulus, with a black point above it on costa; postmedial line black and very oblique from costa to near termen above vein 4, then hardly traceable and incurved, two minute black streaks beyond it on costa; an oblique black streak from apex to the postmedial line, diffused below and angled outwards at vein 7; some black points before inner half of termen; a brownish terminal line. Hind wing white irrorated with brown; some black points before termen towards tornus; the underside white slightly irrorated with brown.

*Hab.* N. NIGERIA, Zungeru (*Macfie*), 1 ♂ type. *Exp.* 18 mm.

#### Genus LOPHOCRYPTIS, nov.

Type, *L. argyrophora*.

Proboscis fully developed; palpi upturned, slender, the second joint reaching to about middle of frons, the third moderate; frons smooth; eyes large, round; antennæ of female ciliated; thorax clothed entirely with scales and without crests; tibiæ slightly fringed with hair; abdomen without crests. Fore wing with the apex rectangular, the termen slightly excised below apex, excurved at vein 4, then oblique; veins 3 and 5 from near angle of cell; 6 from upper angle; 7 shortly stalked with 8, 9; 10, 11 from cell. Hind wing with a large tuft of elongate scales in end of cell on upperside; veins 3, 4 from angle of cell; 5 nearly fully

developed from well above angle ; 6, 7 from upper angle ; 8 anastomosing with the cell near base only.

5310 a. *Lophocryptis argyrophora*, sp. n.

♀. Head, thorax, and abdomen creamy white ; antennæ blackish. Fore wing creamy white irrorated with a few black and silver scales ; antemedial line faint, ochreous brown, excurved below costa, incurved at median nervure and excurved below the cell, an oblique ochreous-brown striga beyond it from costa ; an ochreous-brown discoidal bar with silver scales on the discocellulars, an oblique ochreous-brown striga above it from costa ; a black and silver postmedial point below vein 5 ; postmedial line faint, red-brown, obliquely curved from costa beyond middle to tornus, a rufous tinge before it at middle and the area beyond it suffused with rufous ; three black points on costa towards apex, and a silver patch below costa ; a rather maculate silver line from below costa towards apex to termen at vein 4, and some silver scales below vein 4 before termen ; a series of black striæ before termen from below vein 7 to below 3 and some black on termen from vein 6 to below vein 4 where there are two small black spots on the cilia. Hind wing creamy white, the inner area irrorated with a few black scales ; a series of black points before termen and a silver terminal line ; the underside white irrorated with a few black scales, a series of black points before termen from apex to submedian fold.

*Hab.* GOLD COAST, Bibianaha (*Spurrell*), 1 ♀ type. *Exp.* 20 mm.

GENUS LAMPROLOPHA, nov.

Type, *L. melanephra*.

Proboscis fully developed ; palpi upturned, the second joint reaching to about vertex of head and moderately scaled, the third moderate ; frons smooth ; eyes large, round ; antennæ of male ciliated ; thorax clothed almost entirely with scales and without crests ; tibiæ moderately fringed with hair ; abdomen with dorsal series of crests except on two basal segments. Fore wing with the apex rounded, the termen evenly curved and not crenulate ; veins 3 and 5 from near angle of cell ; 6 from upper angle ; 7, 8, 9 stalked ; 10, 11 from cell. Hind wing with veins 3, 4 from angle of cell ; 5 nearly fully developed from just below middle of discocellulars ; 6, 7 from upper angle ; 8 anastomosing with the cell near base only.

In key differs from *Xanthograptæ* and *Parangitia* in

having a dorsal series of crests except on two basal segments.

5315 a. *Lamprolopha melanephra*, sp. n.

Head, thorax, and abdomen ochreous tinged with grey-brown, the dorsum of thorax with fuscous; antennæ blackish except above towards base; palpi black, the third joint ochreous; pectus and legs black, the tarsi ringed with white; abdomen with the crests silvery placed on black spots which are large on third to fifth segments, small on sixth and seventh, and paired on eighth segment, the ventral surface irrorated with black. Fore wing ochreous tinged with grey-brown and irrorated with some black scales especially on terminal area; a short black streak on costa before the very indistinct waved brown antemedial line; a more distinct waved medial line with oblique black striga from costa; a small black discoidal lunule; postmedial line double, blackish filled in with whitish, the outer line stronger, oblique to vein 6, excurved between veins 4 and 2 and incurved in submedian interspace, some pale points with minute black streaks between them beyond it on costa; subterminal line greyish ochreous, excurved at vein 7 and middle; a punctiform black terminal line; cilia with some blackish spots at middle. Hind wing ochreous tinged with grey-brown, the terminal area suffused with reddish brown; an oblique black discoidal bar; postmedial line black, minutely waved, incurved at discal and submedian folds; an indistinct pale sinuous subterminal line; a rather punctiform black terminal line; cilia with a fine pale line at base and some blackish spots at middle; the underside whitish suffused with black, the lines blackish.

*Hab.* GOLD COAST, Bibianaha (*Spurrell*), 4 ♂, 1 ♀ type, Kumasi (*Sanders*), 2 ♂. *Exp.* 16 mm.

Genus EPICERYNEA, nov.

Type, *E. goniosema*.

Proboscis aborted, minute; palpi upturned, the second joint reaching to well above vertex of head and fringed with hair behind towards extremity, the third long; frons smooth; eyes large, round; antennæ of male with long cilia; thorax clothed almost entirely with scales and without crests; tibiæ slightly fringed with hair; abdomen without crests. Fore wing with the apex rectangular, the termen oblique towards tornus; vein 3 from before angle of cell; 4, 5 from angle; 6 from below upper angle; 7, 8, 9, 10 stalked;

11 from cell. Hind wing with veins 3, 4 from angle of cell; 5 nearly fully developed from well above angle; 6, 7 from upper angle; 8 anastomosing with the cell near base only.

5321 a. *Epicerynea goniosema*, sp. n.

♂. Head, thorax, and abdomen creamy white; antennæ brownish; palpi with the second joint brown behind, the third with black ring near tip; fore legs dark brown. Fore wing creamy white faintly tinged in parts with pink; the costal edge brown towards base; an L-shaped black-brown discoidal mark with oblique black-brown wedge-shaped mark above it from costa; postmedial line faint, brownish defined on outer side by white and with a slight black-brown mark at costa, oblique to vein 5, then erect, a wedge-shaped black-brown patch beyond it on costal area with some pale points on costa; a series of black-brown striæ before termen and a series of slight striæ on termen; cilia with some brown at tips at apex and middle. Hind wing creamy white tinged with pink except at base; a red-brown shade with some black scales on it from lower angle of cell to inner margin; postmedial line pale red-brown defined on outer side by white, curved; a series of red-brown points before termen and a terminal series of slight striæ. Under-side of fore wing suffused and irrorated with brown especially on costal area.

*Hab.* GOLD COAST, Kumasi (*Sanders*), 1 ♂ type. *Exp.* 16 mm.

5342 a. *Cerynea digonia*, sp. n.

♀. Head yellow with a white patch between antennæ, which are white towards base; thorax purple-red, the basal half of tegulæ yellow; pectus and legs yellow; abdomen purple-red, the anal tuft orange-yellow, the base of ventral surface yellowish. Fore wing purple-red irrorated with a few silvery scales; a triangular antemedial yellow patch from costa to just below the cell and a triangular postmedial patch from costa to discal fold; the apex yellow, the termen with yellow mixed, the cilia yellow. Hind wing purple-red irrorated with a few silvery scales; traces of a pale curved postmedial line; the termen with yellow mixed; cilia yellow; the underside pale yellowish, a small brownish discoidal spot, indistinct oblique postmedial line, and broad subterminal shade.

*Hab.* N. NIGERIA, Minna (*Macfie*), 1 ♀ type. *Exp.* 16 mm.

Genus *CHRYSOZONATA*, nov.

Type, *Crysocraspeda flavaria*.

Proboscis aborted, small; palpi upturned, slender, the second joint reaching to middle of frons, the third short; frons smooth; antennæ of female ciliated; thorax clothed almost entirely with scales and without crests; tibiæ slightly fringed with hair; abdomen without crests. Fore wing with the apex rounded, the termen evenly curved and not crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 and 10 anastomosing with 8 and 11 anastomosing with 10 to form a double arcole. Hind wings with veins 3, 4 from angle of cell; 5 nearly fully developed from just below middle of discocellulars; 6, 7 from upper angle; 8 anastomosing with the cell near base only.

5406 c. *Chrysozonata purpurascens*, sp. n.

♀. Head and thorax purplish grey mixed with blackish and some silvery scales; abdomen purplish grey with a flesh-pink tinge towards base, the crests black with silvery scales mixed; palpi, pectus, legs, and ventral surface of abdomen whitish suffused with brown. Fore wing with the base and costal area to near apex purple-grey irrorated with blackish and some silvery scales, the inner half just before the antemedial line and on medial area flesh-pink, the terminal area yellow; antemedial line yellow defined on each side by blackish on the dark area, angled outwards below costa, then oblique and slightly angled outwards in cell and submedian fold; two oblique dark striæ from middle of costa; postmedial line yellow defined on each side by blackish on the dark area and with some flesh-pink suffusion before and beyond it, forming a yellow lunule at discal fold and angled outwards at veins 4, 3, then dark brown, bent inwards to near origin of vein 2 and incurved to inner margin, some dark suffusion beyond it between veins 5 and 3 extending to near termen; a series of dark points just before termen. Hind wing purplish grey suffused with flesh-pink and with some dark brown irroration, the terminal area yellow; rather diffused dark antemedial, medial, and postmedial curved lines, and a dark discoidal striga; a series of dark points just before termen. Under-side of both wings purplish grey to the postmedial line, the terminal area yellowish white.

*Hab.* MASHONALAND (*Dobbie*), 1 ♀ type. *Exp.* 24 mm.

[To be continued.]

XV.—*Rhynchotal Notes*. By W. L. DISTANT.

## HETEROPTERA.

## Fam. Pentatomidæ.

*Cryptacrus comes*.

*Tetyra comes*, Fabr. Syst. Rhyn. p. 130 (1803).

This is a very variable species. In Ent. Month. Mag. (xiv. p. 75, 1877) I enumerated the varieties then known, denoting these forms under different letters only. One of these has, however, been given a distinct varietal name by Horváth, while other writers have followed the same method in describing varieties of species in allied genera; I therefore follow that course.

*entebbensis*, var. n.

Uniformly dark violaceous or olivaceous above, as in var. *princeps*, Horv., but the scutellum with a broad, subapical, angulated, transverse, ochraceous fascia; the lateral margins of the pronotum and a narrow transverse discal spot on each side of scutellum also ochraceous.

*Hab.* Uganda; Entebbe (C. C. Gowdey).

*apicalis*, var. n.

Allied to the preceding variety *entebbensis*, but with the apex of the scutellum ochraceous or testaceous and the discal scutellar markings absent.

*Hab.* Nyasaland; Melanji Boma, 2400 ft. (S. A. Neave). Also received from Gazaland, Mt. Chirinda (C. F. M. Swynerton); Zomba (A. Whyte), and from Utonda.

*Anoplogonius nigricollis*.

*Cherocoris nigricollis*, Sign. in Thoms. Arch. Ent. ii. p. 270, pl. xi. fig. 1 (1858).

*uniformis*, var. n.

*Cryptacrus nigricollis*, var. *e*, Dist. Ent. Month. Mag. xiv. p. 76 (1877).

*Hab.* Uganda; Entebbe (A. C. Wiggins); Bugoma Forest, Unyoro, 3700 ft., Buamba Forest, Semliki Valley, 2300–2800 ft., Daro or Durro Forest, Toro, 4000–4500 ft., Bundongo Forest, Unyoro, 3400 ft. (S. A. Neave). Originally received from West Africa; Mongo-ma-lobah.



*ugandensis*, var. n.

Resembling var. *uniformis*, but with a transverse, sub-apical, angulated, ochraceous or testaceous fascia to scutellum, which in some examples possesses a spot of the same colour at each anterior angle.

*Hab.* Uganda; Entebbe (*C. A. Wiggins*); S. of Lake George, 3200-3400 ft., Buamba Forest, Semliki Valley, 2300-2800 ft., Budongo Forest, Unyoro, 3400 ft. (*S. A. Neave*); Semliki Forest, 3000 ft. (*Capt. J. Fraser*).

### Fam. Coreidæ.

#### Genus SERINETHA.

*Serinetha*, Spin. Ess. p. 247 (1837).

The fine series of species belonging to this genus contained in the collection of the British Museum has been largely augmented by the material derived from the various collectors enlisted by the "Entomological Research Committee," and opportunity has thus occurred for describing some species and removing errors which have appertained to the identifications of others.

#### *Serinetha fraterna*.

*Pyrrhotes fraterna*, Westw. in Hope, Cat. ii. p. 26 (1842).

*Serinetha fraterna*, Dist. Proc. Zool. Soc. Lond. 1901, vol. i. p. 332, pl. xxx. fig. 6.

The type of this species is, as I stated (*supra*), "without legs, antennæ, or habitat." The British Museum possesses specimens from Cape Town (*Mowbray*) and Natal, Durban (*Barnard*). Schouteden has recorded the species as from the Congo region.

#### *Serinetha mutilata*.

*Astacops mutilatus*, Gerst. Decken's Reise, Ins. p. 412, pl. xvii. fig. 3 (1873).

*Hab.* Brit. E. Africa, Mtito Andei, and Lualaba River (*S. A. Neave*); Uganda, Entebbe (*S. A. Neave*). The Brit. Mus. also possesses specimens from Natal, Transvaal, and Mashonaland. The type was from Mombas.

The colour varies from testaceous to dull ochraceous. The species is readily recognized by the very prominent longitudinal ridge to the pronotum and by the distinct black lateral margin to the corium.

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*Serinetha nigrofasciata*, sp. n.

Ochraceous or reddish ochraceous; head, transverse fascia at anterior margin of pronotum, basal margin of scutellum, and membrane black; body beneath ochraceous or reddish ochraceous, the sternal and abdominal segments broadly transversely fasciated with black; legs, antennæ, and rostrum black; ocelli, eyes, and nodule behind eyes purplish red, ocelli nearer to eyes than to each other; antennæ with the first joint moderately thickened, short, passing apex of head, second and fourth joints almost subequal in length, each longer than third; pronotum thickly punctate and wrinkled, with a moderately prominent central longitudinal ridge; corium finely punctate; rostrum reaching the posterior coxæ.

Long.  $11\frac{1}{2}$ –15 mm.

*Hab.* Uganda, Entebbe (C. C. Gowdey), Mpumu (Miss M. Robertson), Mabira Forest (S. A. Neave); Brit. E. Africa, Nandi escarpment and plateau (S. A. Neave).

Bergroth identified and returned a specimen of this species labelled "*S. griseiventris*, Westw.," with other species to which he alluded (Ann. & Mag. Nat. Hist. (8) x. p. 191, 1912). It is, however, quite unlike that species, and even the meagre description given by Westwood should prevent this confusion.

*Serinetha intermedia*, sp. n.

A species resembling *S. nigrofasciata* in general markings above and in the only moderately developed longitudinal ridge to the pronotum; it, however, possesses black lateral margins to the corium, as in *S. mutilata*, Gerst., although much more narrowly black than in that species, the body beneath is also almost uniformly ochraceous, and the legs brownish ochraceous; the head is fuscous, not black, from the area of the ocelli to apex; the lateral margins of the pronotum very narrowly fuscous or black; the pronotum is thickly, somewhat coarsely punctate, with the anterior transverse black fascia as in *S. mutilata*; the body is narrower and more compressed than in the other two species mentioned above.

Long. 10 mm.

*Hab.* Uganda (C. C. Gowdey).

*Serinetha amicta*.

*Leptocoris amicta*, Germ. in Silberm. Rev. p. 144 (1837).

*Hab.* Uganda; Entebbe (C. C. Gowdey and S. A. Neave).

Brit. E. Africa ; Nandi plateau, 5700–6200 feet, escarpment 5800 feet (*S. A. Neave*).

*Serinetha griseiventris*.

*Pyrrhotes griseiventris*, Westw. in Hope, Cat. ii. p. 26 (1842).

*Serinetha chevreuxi*, Nonalh. Bull. Mus. d'Hist. Nat. Paris, 1898, p. 233.

*Serinetha griseiventris*, Dist. Proc. Zool. Soc. Lond. 1901, vol. i. p. 332.

*Hab.* Uganda ; Entebbe (*C. C. Gowdey*), Mpumu (*Miss M. Robertson*), between Jinga and Busia, E. Busoga (*S. A. Neave*) ; German E. Africa, by Ruaha R. (*S. A. Neave*).

Westwood's description of this species—" *P. auguri* valde affinis"—makes its identification a not difficult question.

*Serinetha hæmatica*.

*Leptocoris hæmatica*, Germ. in Silb. Rev. v. p. 144 (1837).

*Hab.* N.E. Rhodesia, Ft. Jameson, 3800 ft. (*S. A. Neave*). Uganda ; Kafu River, Kampala, 3500 ft. (*S. A. Neave*). Portug. E. Africa, Kurumadzi R. (*C. F. M. Swynnerton*).

This species is found in S. Africa, Madagascar, Mauritius, and Seychelles. It is separated from *S. griseiventris*, Westw., to which it is closely allied, by the shorter rostrum, which only about reaches the posterior coxæ.

I take this opportunity of describing another species which is found in the Oceanic Islands :—

*Serinetha isolata*, sp. n.

Pronotum, scutellum, and corium fuscous brown, scutellum sometimes blackish ; head, anterior and lateral margins of pronotum, base of lateral margins to corium, and body beneath testaceous ; a transverse fascia near anterior margin of pronotum, lateral areas of pro-, meso-, and metasterna, disk of ventral abdominal segments, legs, rostrum, and membrane black ; rostrum reaching the posterior coxæ ; vertex of head centrally longitudinally incised ; antennæ with the basal joint short, thickened, passing apex of head, second and third joints subequal in length, fourth a little longest ; pronotum with a distinct, percurrent, longitudinal, central carination ; head above with a distinct rounded tubercle behind each eye.

Long. 13–16 mm.

*Hab.* Oceania ; Marshall Islands.

Allied to *S. longirostris*, Dall, from Java, but differing by the shorter rostrum &c.

Fam. *Pyrrhocoridae*.*Callibathus albipennis*, sp. n.

Head, pronotum, and corium purplish red; a central longitudinal fascia (broadened posteriorly) to head, a transverse subapical fascia to pronotum, the scutellum, base of clavus, a transverse fascia (on each side of basal angles to membrane), and a subapical rounded spot to corium black; membrane pearly white; head beneath, sternum, coxæ, trochanters, and apices of femora purplish red; the disks of pro-, meso-, and metasterna, legs, and abdomen black; the ventral segments more or less suffused with purplish red; antennæ black, base of first joint purplish red, first joint moderately curved, considerably shorter than second, third a little shorter than first, fourth mutilated in typical specimens; head above finely transversely wrinkled; lateral margins of pronotum, especially on anterior half, laminately recurved; rostrum reaching the anterior margin of sixth abdominal segment, first and second joints more or less red, remainder black.

Long. 28-32 mm.

*Hab.* Uganda; Daro or Durro Forest, 4000-4500 ft.; S. of L. George, 3200-3400 ft. (*S. A. Neave*); Kamwezi (*C. H. Marshall*).

## HOMOPTERA.

Fam. *Cicadidæ*.

Prof. Poulton recently placed in my hands for identification a very interesting Cicadid from Algeria, of which he had received three specimens, collected by Dr. Seitz. This species belongs to a genus which, with two or three others appertaining to the subfam. *Tibicininæ*, are recognized by the excavated ventral surface in the male, medially longitudinally carinate, with the second, third, and fourth segments broad, flat, and talc-like in appearance.

The three genera here enumerated may be separated by the following characters:—

- A. Wings with five apical areas..... *Adeniana*.
- B. Wings with six apical areas.
  - a. Head with front prominently projecting, the margins of front and vertex discontinuous and more or less at right angles to each other ..... *Zouga*.
  - b. Antenniferous tubercles very large and prominent and reaching the anterior margin of the front, thus giving the head a truncate appearance ..... *Luangwana*.

## ADENIANA.

*Adenia*, Dist. Ann. & Mag. Nat. Hist. (7) xvi. p. 210 (1905), nom. præocc.

*Adeniana*, Dist. Syn. Cat. Hom., Cicad. p. 149 (1906), n. nom.

Type, *A. yerburyi*, Dist.

*Adeniana yerburyi*.

*Adenia yerburyi*, Dist. Ann. & Mag. Nat. Hist. (7) xvi. p. 211 (1905).

*Adeniana yerburyi*, Dist. Syn. Cat. Hom., Cicad. p. 149 (1906).

Aden.

*Adeniana obokensis*, sp. n.

Head and pronotum ochraceous; front (excluding lateral margins) and the area of the ocelli piceous, lateral margins of vertex and lateral and posterior margins of pronotum paler ochraceous, the latter with a central fascia, widened anteriorly and posteriorly, and the fissures piceous; mesonotum pale ochraceous, with four large black obconical spots, the two central ones smaller and contiguous, the outer spots almost percurrent; abdomen above ochraceous, the base and a central segmental series of transverse spots black; posterior segmental margin pale ochraceous; head beneath, sternum, legs, rostrum, and opercula ochraceous; abdomen beneath pale greyish, the two last segments ochraceous; tegmina and wings hyaline, venation piceous, the first with the costal membrane and some of the basal veins, wings with some of the basal veins and the transverse veins at bases of central apical areas ochraceous; head with front conically produced, a little shorter than vertex, the anterior margins of latter rounded, and moderately at right angles with front; pronotum about as long as head, its posterior angles widely ampliate; abdomen somewhat broad, only moderately contracted at base; face slightly longer than broad, centrally broadly, longitudinally, smoothly stramineous, the transverse striations piceous; rostrum scarcely reaching the intermediate coxæ; opercula short and transverse, their apices directed somewhat straightly inwards, their lateral angles rounded; wings with five apical areas.

Long., excl. tegm., ♂ 18 mm.; exp. tegm. 45 mm.

*Hab.* Gulf of Aden; Obok (Brit. Mus.).

*Adeniana nigricans*, sp. n.

Head, pronotum, and mesonotum black; apex of front, lateral margins of vertex, and margins and a spot to lateral

areas of pronotum ochraceous; abdomen above black, the posterior segmental margins ochraceous; head beneath and sternum thickly, longly, greyishly pilose, tibiae broadly annulated with ochraceous; abdomen beneath pale greyish, the posterior segmental margins and the last two segments ochraceous and thickly shortly pilose; tegmina and wings hyaline, venation and costal membrane of the first more or less ochraceous; front prominent and conically produced, almost as long as the vertex, the latter with its anterior margin rounded and moderately at right angles with front; pronotum about as long as head, its posterior angles widely ampliate; abdomen distinctly contracted at base; face about as broad as long, somewhat distinctly ridged centrally, transverse striations prominent; rostrum not quite reaching intermediate coxæ; opercula small, transverse, narrow, straightly directed inwardly, outer angle rounded, inner angle subacute; abdomen beneath considerably covered by the margins of the dorsal segments; wings with five apical areas.

Long., excl. tegm., ♂ 18 mm.; exp. tegm. 47 mm.

*Hab.* Algeria; Hammam-es-Salahin (*M. J. Nicoll*, Brit. Mus.).

*Adeniana seitzi*, sp. n.

Head, pronotum, and mesonotum black, thickly greyishly pilose; on the pronotum are two obscure central longitudinal greyish fasciæ, on the anterior area of the mesonotum obscure greyish margins of two obconical spots; abdomen above dull brownish ochraceous, the two basal segments and a more or less distinct central macular fascia to the remaining segments, black, posterior segmental margins dull greyish; head beneath and sternum thickly greyishly pilose; abdomen beneath pale greyish, the last two segments more ochraceous; tegmina and wings hyaline, venation black, tegmina with the costal membrane and some of the basal veins, and wings with some of the basal veins, and the transverse veins at bases of central apical areas, ochraceous; head with front conically produced, much shorter than vertex, the anterior margins of the latter completely at right angles with front; pronotum about as long as head, its posterior angles widely ampliate; abdomen somewhat broad, contracted at base; face a little longer than broad, its margins somewhat laminate; rostrum scarcely reaching the intermediate coxæ; opercula short and transverse, obliquely directed inwardly, irregularly convexly rounded outwardly and posteriorly.

Long., excl. tegm., ♂ 15 mm.; exp. tegm. 32 to 34 mm.

*Hab.* Algeria ; Province Constantine, Batra, 1300 metres (Seitz, Oxford and Brit. Muss.).

I place this species in *Adeniana*, with which it generally agrees with the type, save that in the only three specimens I have seen, the left wings have the usual five apical areas, while the right wings have six.

#### ZOUGA.

*Zouga*, Dist. "Ins. Transvaal," i. p. 176 (1906).

*Hymenogaster*, Horv. Ann. Mus. Nat. Hung. ix. p. 601 (1911).

Type, *Z. typica*, Dist.

#### *Zouga typica*.

*Zouga typica*, Dist. Ins. Transvaal, i. p. 176, Tab. xvi. fig. 18 (1906).

Transvaal.

#### *Zouga hottentota*, sp. n.

Body above black ; anterior margins of the vertex, anterior and posterior margins of the pronotum, and the abdominal segmental margins testaceous ; body beneath and legs pale castaneous, longly, thickly, greyishly pilose ; tegmina and wings hyaline, venation and the tegminal costal membrane castaneous ; head with the front prominent, conically produced, about as long as the vertex behind it, the latter with its anterior margins truncately rounded and at right angles with front ; pronotum about as long as head, its posterior angles widely ampliate ; mesonotum as long as head and pronotum together ; face a little longer than broad, densely pilose ; rostrum reaching intermediate coxæ ; opercula small, transverse, obliquely directed inwardly, their apices widely separated ; abdomen beneath excavate, the lateral margins prominently, laminately deflected ; wings with six apical areas.

Long., excl. tegm., 16 mm. ; exp. tegm. 45 mm.

*Hab.* S. Africa ; Namaqualand ; Ookiep (Brit. Mus.).

#### *Zouga delalandei*, sp. n.

Head, pronotum, and mesonotum black ; pronotum with the anterior and posterior margins and four spots (two discal largest, and one smaller beneath and beyond each), mesonotum with the margins of two central obconical spots testaceous ; abdomen above testaceous, the base and central macular fasciæ black, the segmental margins ochraceous ; body beneath and legs ochraceous ; tegmina and wings

hyaline, venation and tegminal costal membrane brownish ochraceous; head with front conically produced, about as long as the vertex behind it, the anterior margins of the vertex moderately rounded and almost at right angles with the front, which is centrally longitudinally incised, the area of the ocelli with two prominent ridges; pronotum about as long as head, the posterior angles widely ampliate; rostrum reaching the intermediate coxæ; tegmina with the costal membrane slightly undulate; wings with six apical areas, the first very small.

Long., excl. tegm., ♂ 12 mm.; exp. tegm. 24 mm.

*Hab.* "South Africa" (*Delalande*, Brit. Mus.).

*Zouga kovasci*.

*Hymenogaster kovasci*, Horv. Ann. Mus. Nat. Hung. ix. p. 604 (1911).

Abyssinia.

*Zouga longiceps*.

*Cicadatra longiceps*, Put. Rev. d'Ent. vi. p. 104. 18, ♀ (1887).

*Hymenogaster longiceps*, Horv. Ann. Mus. Nat. Hung. ix. p. 601, fig. 1 (1911).

Egypt; Tunis.

*Zouga tabida*.

*Hymenogaster tabida*, Horv. Ann. Mus. Nat. Hung. ix. p. 603 (1911).

Armenia.

LUANGWANA, gen. nov.

Head a little shorter than pronotum, the antenniferous tubercles very large and prominent and reaching the anterior margin of the front, thus giving the head a truncate appearance, ocelli about as far apart from each other as from eyes and placed near base of head; pronotum slightly longer than head, its posterior angles widely ampliate, its lateral margins oblique; mesonotum a little shorter than head and pronotum together, convex; abdomen somewhat broad, a little constricted at base, convex above, flattened beneath, the second, third, and fourth ventral segments very broad, flat and talc-like in appearance, fifth and sixth segments very compressed and short; opercula in male very short and transverse, not reaching base of abdomen; tympana entirely uncovered; rostrum scarcely reaching the intermediate coxæ; anterior femora thickened, finely spined beneath; tegmina



and wings hyaline, tegmina less than three times as long as broad, basal cell about or almost as broad as long, apical areas eight, the uppermost narrow; wings with six apical areas.

Allied to *Zouga*, Dist., but differing widely by the structure of the head.

*Luangwana capitata*, sp. n.

Head and pronotum ochraceous; front and area of the ocelli, a central longitudinal fascia widened posteriorly, and a spot on each lateral area to the pronotum black; mesonotum black, its lateral margins, two central angulated fasciæ, and anterior angles to the basal cruciform elevation ochraceous; abdomen above ochraceous, the segmental margins paler, the base and a central, broken, longitudinal fascia black; body beneath and legs ochraceous, second, third, and fourth ventral segments greyish white, centrally, longitudinally ridged; tegmina and wings hyaline, venation mostly piceous, tegmina with the costal membrane ochraceous; body above and beneath pilose; pronotum with a very fine central, longitudinal incision; other structural characters as in generic diagnosis.

Long., excl. tegm., ♂ 14 mm.; exp. tegm. 34 mm.

*Hab.* N.E. Rhodesia; Mid-Luangwa Valley, 1300–1800 ft. (S. A. Neave, Brit. Mus.).

*Plautilla hammondi*, sp. n.

Head, pronotum, and mesonotum greenish ochraceous; front, anterior margins, a curved line before eyes, and the area of the ocelli to vertex, two short central angulate fasciæ followed by two subquadrate spots; and the fissures to pronotum, four obconical spots, the two central ones shortest, the two lateral percurrent, two small discal spots and the area of the cruciform elevation to mesonotum castaneous-brown; abdomen above dark chocolate-brown, the basal lateral area ochraceous; head beneath, sternum, and opercula ochraceous, the inner margins and apex of the opercula broadly black; apices of tibiæ piceous; abdomen beneath with the first four segments greyish ochraceous, with a central black tubercle near their anterior margins, apical segment black; connexivum spotted with black; tegmina and wings hyaline, venation fuscous, tegmina spotted and marked almost the same as in *P. stalagmopera*, Stål.

Long., excl. tegm., ♂ 21 mm.; exp. tegm. 66 mm.

*Hab.* Ecuador; Mindo (*Hammond*, Brit. Mus.), presented by Mr. W. F. H. Rosenberg.

Allied to *P. stalagmoptera*, Stål, but with the opercula larger, distinctly narrowed, and obtusely angularly produced at their apices, and there broadly black; pronotum much narrower between the apices of the lateral angulate margins.

*Synonymical Note.*

*Dalsira crassa*, Dist. Ann. & Mag. Nat. Hist. (7) ii. p. 303 (1898).

Schouteden (Rev. Zool. Afr. ii. p. 107 (1912), in enumerating this species from the Transvaal, writes "cette espèce a été décrite comme *Metonymia* (*Dalsira* ol.) par Distant."

I described it as *Dalsira* (supra) in 1898, and, as the genus *Metonymia* was only proposed by Kirkaldy in 1909, I cannot well be charged with an impossibility.

XVI.—*On some Remains of Rodents from the Red Crag of Suffolk and from the Norfolk Forest-Bed.* By MARTIN A. C. HINTON.

[Plate VIII.]

IN the present paper some important fossils from the Red-Crag and the Forest-Bed series of Norfolk are described. These materials appertain to the genera *Castor*, *Trogontherium*, and *Sciurus*. I have to return my best thanks to Major Moore, of Felixstowe, Mr. A. C. Savin, of Cromer, and Mr. Gilbert White for the loan or gift of the specimens described.

1. CASTOR.

(a) *Castor veterior*, Lankester.

A fragmentary right ramus in the collection of Major Moore, from the Red Crag of Woodbridge, Suffolk, is referred to this species. In this specimen (Pl. VIII. fig. 1)  $\overline{p}_4$ ,  $\overline{m}_1$ , and part of  $\overline{m}_2$  are in place. The crown of  $\overline{p}_4$  is fully developed, while  $\overline{m}_1$  has well-developed fangs (fig. 1, "a"). Each tooth has one outer and three inner folds and, as in *C. fiber*, the enamel is uncrimped. The outer fold is persistent, as usual in *Castor*; the anterior and middle inner folds of  $\overline{p}_4$  are also long persistent as in *C. fiber*. The posterior inner fold of  $\overline{p}_4$  and all three

inner folds of  $\overline{m.1}$  die out on the sides of the teeth a little below the present grinding-surface, so that, with a little further wear, these folds would be converted into enamel "islets."  $\overline{p.4}$  is in relation to  $\overline{m.1}$  a little longer antero-posteriorly than in *C. fiber*; its anterior surface is lightly furrowed by a weak vertical sulcus—the last trace of a former more complex condition of the anterior loop.

Dimensions:—

|   | <i>C. veterior.</i> | <i>C. fiber.</i> |
|---|---------------------|------------------|
|   | mm.                 | mm.              |
| Antero-posterior length of $\overline{p.4}$ ..... | 10                  | 9·5              |
| Width of $\overline{p.4}$ behind .....            | 8                   | 8                |
| Antero-posterior length of $\overline{m.1}$ ..... | 7                   | 8·5              |

In the two upper premolars, from the Red Crag of Sutton, upon which Sir E. Ray Lankester based his *C. veterior*\*, Mr. E. T. Newton found that "two of the three outer folds of enamel are only open to the exterior for a short distance from the summit of the tooth"†; the lower teeth now described present corresponding characters, and may therefore be referred to *C. veterior*. The differences in the number of folds reduced peripherally in the individual teeth, viz., all three inner in  $\overline{m.1}$ , two outer in  $\overline{p.4}$ , and one inner in  $\overline{p.4}$ , are in harmony with our experience of such reductions in other rodents.

In the relatively large size of  $\overline{p.4}$ , and in the early conversion into "islets" of the inner folds of lower and the outer folds of upper cheek-teeth, *C. veterior* makes some approach dentally towards *Trogotherium*; in the latter all the enamel folds are so reduced during wear, and in its later species there is a great increase in the size of the animal.

*C. issiodorensis*, Croizet, is stated by Pomel‡, Gervais§, and Bosco|| to be hardly or not at all different from *C. fiber*, so far as it is known. *C. præfiber*, Deperet¶, from the Pliocene of Rousillon, is distinguished by its slender molars and the absence of a third trochanter to the femur. To one of these two forms the Red Crag beaver with persistent enamel-folds, provisionally referred by Newton to *C. fiber*, not improbably belongs.

\* Lankester, Ann. & Mag. Nat. Hist.(3) xiv. p. 355 (1864).

† Newton, 'Vertebrata of the Pliocene Deposits of Britain,' p. 50 (1891).

‡ Pomel, 'Catalogue Méthodique,' p. 20.

§ Gervais, Zool. et Pal. Franç. 1859, p. 20.

|| Bosco, 'Palæontographia Italica,' v. p. 89.

¶ Deperet, Mém. Soc. Géol. de France, Paléontol. no. 3 (1890).

(b) *Forest-Bed Beavers.*

Forsyth Major\* has shown that two species of *Castor* occur in the Forest-Bed horizon exposed at East Runton, Norfolk. One, characterized by its broader incisors, slightly larger cheek-teeth, and, above all, by the "complex and elegant plication" of the enamel of its molars, is identical with *C. plicidens*, Major, a species described from the Upper Pliocene of the Val d'Arno; the other, with narrower incisors, smaller molars, and much less plicated enamel, makes a nearer approach to the recent species, and it is the only form which has been found hitherto in the Upper Freshwater Bed at West Runton. Recently Mr. Savin has found in the latter deposit two young upper cheek-teeth of *Castor*, each being either the right  $\underline{m}^1$  or  $\underline{m}^2$  (Pl. VIII. figs. 2 & 3). Each tooth presents the usual enamel pattern, and in each the enamel, as exposed at the grinding-surface (figs. 2 a, 3 a), is free from plication. An examination of their bases shows that, while in the smaller tooth the enamel would remain uncrimped (fig. 3 b), in the larger one (fig. 2 b) it acquires in deeper strata of the crown the complex and elegant plication of *C. plicidens*. Bosco† has shown that the jaw from the Val d'Arno, on which Forsyth Major based his *C. rosinae*‡, is, in fact, a young jaw of *C. plicidens*; the enamel at the grinding-surface of the little-worn teeth of this jaw is free from plication, but a section made through the basal parts of the teeth shows that the typical plication is developed in the deeper portions of the teeth, just as in the West Runton specimen. It may be mentioned, further, that whereas in the molars of the lower jaw from East Runton figured by Forsyth Major the plication principally affects the enamel of the first and third inner folds, in the West Runton tooth all three of the corresponding outer folds display it.

Mr. Savin possesses a large right ramus from the Forest Bed of Bacton with all the teeth in place. It belonged to an old individual. The molars are greatly worn and some of them are mutilated; their crowns still show, particularly in the antero-internal fold of each tooth, traces of a strong plication of the enamel. The incisor is very broad. This jaw also may, perhaps, be referable to *C. plicidens*.

\* Forsyth Major, Proc. Zool. Soc. 1908, p. 630.

† Bosco, *op. cit.* p. 88.

‡ Forsyth Major, Arch. per l'antrop. e l'etnografia, vol. vi. p. 345 (1876).

## Dimensions :—

|                                      | mm.      |
|--------------------------------------|----------|
| Alveolar length of cheek-teeth ..... | 39       |
| Breadth of incisor .....             | 9.3      |
| $\frac{p}{p.4}$ at crown .....       | 11 × 8.5 |
| Diastema .....                       | 34       |

*C. plicidens* appears to be a specialized offshoot which arose and became extinct in the Upper Pliocene period. Forsyth Major tells us that in aged teeth of *C. fiber* a moderate plication of the enamel makes its appearance. *C. plicidens* seems thus to have rapidly acquired a dental feature which the recent beaver, had it been left alone, might have developed in the fullness of time.

2. *Trogontherium cuvieri*.

Among the specimens from the Upper Freshwater Bed of West Runton in Mr. Savin's private collection are three fragmentary and very young incisors which, despite their small size, apparently belong to the *Trogontherium*. Two of them (Pl. VIII. figs. 4 & 5) are sharply curved and are evidently left upper incisors. Their sectional diameters increase rapidly posteriorly, and they are characterized by their convex faces of rugose enamel. The outer surface in each is traversed by a narrow groove along the junction of the enamel with the dentine, and there are fainter indications of a similar feature on the inner surface. The tip of the smaller and younger specimen presents a round, rather uneven, wearing surface. The larger specimen has been in use long enough to have lost by wear that portion of the crown which is represented by the smaller tooth, and, although the end is now somewhat mutilated, to have acquired a normal disc of wear.

The third specimen is very small, its broken base not being wider than the tip of the smaller upper incisor just described. It is straighter than either of the others, and may be determined as the left lower incisor (Pl. VIII. fig. 6). The enamel of the convex anterior face is finely rugose; there is a narrow groove on the outer and a still narrower and less distinct one on the inner surface. The tip (fig. 6a & b) is quite unworn and consists of two little tubercles—a higher inner and a lower outer one—separated from each other by an anterior and by a posterior valley. These valleys extend downwards upon the front and hinder surfaces of the tooth for a distance of about 1 mm., and then die out. The posterior valley (fig. 6a) is a deeply re-entrant V-shaped notch, cutting the

crown to its centre ; the less deeply re-entrant anterior valley (fig. 6*b*) has its floor raised as a little rib. Each valley contains a little cement. The hinder sides of the tubercles and the posterior valley are invested with a thin coat of enamel, but whether the latter extends over the apices of the tubercles or not is uncertain. The grooves of the outer and inner surfaces—persistent features in adult incisors of *Trogontherium*—are seen to start from the summit.

In discussing the grooved upper incisors of *Lagomorpha* Forsyth Major\* has stated that:—"The incisors provided with enamel-folds point back towards cuspidate incisors, for the enamel-folds of lophodont and laminated teeth are obviously the derivatives and homologues of the 'valleys' separating the cusps or tubercles." In this connection it is of very great interest to find traces of the primitive complexity in the unworn incisor of *Trogontherium*. It may be that in some cases, where one or more grooves channel the anterior faces of the incisors, their persistence is due to the fact that such grooves are of use to the animal retaining them, as Tullberg† suggests ; but, in my view, it is wrong to regard such a groove as a new feature produced in any given case, because it is there useful. It is a fact that frequently in *Lagomorpha* and in other rodents more or less distinct traces of a posterior incisor valley can be found in the form of a shallow sulcus, which, devoid of enamel, can hardly be of any functional importance. Further, in many voles vestiges of vanished valleys can be found as narrow, shallow, well-defined, and persistent grooves upon the sides of their molars ; in these cases it is only by a study of unworn or little-worn teeth that the true significance of such, at first sight, trivial features becomes apparent.

One of the most interesting of Mr. Savin's recent acquisitions from the West-Runt deposit is a foot-bone, which I have determined as the right navicular of *Trogontherium*—a part hitherto unknown. In Pl. VIII. fig. 7 four views of the fossil are given, with corresponding views (fig. 8) of the navicular of *Castor fiber*. Generally the fossil closely agrees with the recent bone in form and in the number and arrangement of the facettes ; it differs principally in having the articular surfaces much larger, the posterior spur, on the other hand, much smaller—so that, as a result, its absolute size is but little greater. Anteriorly it is wider, posteriorly

\* Forsyth Major, Trans. Linn. Soc., Zool. ser. 2, vol. vii. p. 470 (1899).

† Tullberg, 'Ueber das System der Nagethiere,' p. 363.

narrower, so that its plan is triangular instead of nearly rectangular. In the beaver the astragalean facette is a circular, rather deep basin, with a well-defined posterior rim, occupying about half of the proximal surface; in the fossil it is a rather shallow, irregularly shaped concavity, with an ill-defined posterior margin occupying fully two-thirds of the proximal surface. The distal surface presents the usual three facettes for the cuneiforms, and these have a greater antero-posterior extent than in the beaver. The facette for cuneiform III. is nearly plane instead of concave antero-posteriorly; that for cuneiform II. is relatively wider and gently convex from behind forwards, instead of nearly flat. The facette for cuneiform I. is large, crescentic, and concave, forming the anterior side and roof of a profound notch which cuts almost through the bone from the distal to the proximal surface; in the beaver this notch is much less deep and the facette is greatly reduced and convex, only the anterior part of the facette of the fossil being represented. On the other hand, in the beaver the anterior face of the greatly developed descending process or "spur" bears a small additional facette for the posterior margin of cuneiform I., which is not represented in the fossil. Between the superior border of the chief facette for cuneiform I. and the astragalean surface there is in the beaver a rather large, slightly inclined, oval facette for the "*naviculare tibiale*"; in the fossil this facette is also present, but is narrower, triangular in shape, and highly inclined. The outer (fibular) side of the bone is occupied anteriorly by the cuboid facette. In the beaver this is relatively short, low behind, its plane nearly vertical, and very slightly concave antero-posteriorly. In the fossil it is longer, much higher behind, its nearly vertical anterior portion faces backwards and outwards, and its oblique hinder part faces slightly forwards, downwards, and outwards; the outer border of the bone, when viewed from below, consequently appears widely notched instead of straight or gently concave. The posterior spur is much less developed than in the beaver; in the latter its plan is nearly square, its flat upper surface ascends posteriorly, while below it is produced as a massive projection descending considerably below the general level of the distal surface; in the fossil it is narrower, its upper surface is rounded and shelves away behind and laterally, while below the descending process is little developed and scarcely attains the level of the distal surface. The measurements recorded in the following table bring out many important distinctions:—

| Measurements of navicular<br>(millimetres).   | <i>Trogontherium.</i><br>Forest Bed: W. Runtou. |             |            | <i>Castor.</i><br>Alluvium: Thames. |             |            |
|---|---|-------------|------------|-------------------------------------|-------------|------------|
|   | Absolute.                                       | Reductions. |            | Absolute.                           | Reductions. |            |
| Antero-posterior diameter .....   | 19·7  | <b>100</b>  | 168        | 18·7                                | <b>100</b>  | 217        |
| Transverse width in front .....   | 15·7  | 79·8        | 134        | 13·7                                | 73·4        | 159        |
| "    "    behind.....   | 7·1   | 36·1        | 60·8       | 8·6                                 | 46          | 100        |
| Width of astragalean facette ....   | 11·7  | 59·4        | <b>100</b> | 8·6                                 | 46          | <b>100</b> |
| "    facette for cun. III.....  | 8·6   | 43·7        | 73·5       | 9·0                                 | 48·2        | 105        |
| "    "    "    II. ....   | 6·6   | 33·5        | 56·4       | 5·0                                 | 26·8        | 53·2       |
| Antero-posterior diameter of facette for cun. III.....                                | 6·8   | 34·6        | 58·2       | 5·7                                 | 30·5        | 66·2       |
| Antero-posterior length of cuboid facette .....                                       | 12·0  | 61          | 102        | 10·5                                | 56·2        | 122        |
| Height of cuboid facette at post.-external corner of facette for cun. III. ....       | 5·0   | 25·4        | 42·8       | 5·2                                 | 27·8        | 60·5       |
| Height of cuboid facette behind .   | 6·6   | 33·5        | 56·4       | 4·8                                 | 25·7        | 55·9       |
| Least distance between facette for cun. III. and front edge of proximal surface ..... | 5·1   | 25·9        | 43·6       | 4·0                                 | 21·4        | 46·5       |
| Height of spur behind.....  | 7·3   | 37·1        | 62·4       | 11·0                                | 58·8        | 128        |

From this description it is clear that the fossil navicular belonged to an animal possessing close affinities with the beaver; nevertheless, the differences observed are of generic importance. A comparison of the articulations shows that the fossil formed part of a considerably larger foot than that of *Castor*. The only larger beaver-like rodent known from the Forest Bed is the *Trogontherium*, and, in view of all the facts, no reasonable doubt can remain that the fossil is rightly referred to this genus. In the beaver the fourth metatarsal is the longest and stoutest, the third is little shorter though more slender, the second and fifth are much smaller, and that of the hallux is still further reduced. From the fact that the facette for cuneiform III. is narrower, while those for cuneiforms II. and I. are wider and more extensively developed in the fossil, we may infer that the disparity in the size of the three cuneiforms, and consequently of the first, second, and third metatarsals which they support, was less marked in the *Trogontherium* than in the beaver. The slighter development of the posterior spur in the fossil betokens less powerfully developed flexor muscles. The enlargement of



the third and fourth toes in the foot of the beaver is a feature seen also in the feet of many other aquatic mammals, and is a specialization for swimming. From the circumstance that, judging from the navicular, these two digits were less specially favoured in *Trogontherium*, we may infer that the latter was less aquatic than *Castor*.

Since writing the above paragraph I have read Owen's account\* of some limb-bones referred by him to *Trogontherium*. They included the humerus, femur, tibia and anchylosed fibula, and the calcaneum. The humerus was much larger proportionally, the femur much shorter in relation to the tibia, than in *Castor*. The femur is clearly much less specialized, differing principally in the smaller and more highly placed third trochanter, the rounder and thicker lateral borders of its distal half, and its slighter distal expansion. The tibia is longer and has a shallower posterior groove, and the fibula is more extensively anchylosed with it below. The calcaneum presents features analogous to those described in the navicular. As in the latter the posterior non-articular part is shorter relatively, the articular part more largely developed; it is also broader, and there are similar differences in the form and curvature of the facettes. It is with satisfaction that I note that Owen inferred "from the femoral modifications that the *Trogontherium* was less aquatic and a swifter mover upon land than the beaver."

*Sciurus whitei*, sp. n.

Many years ago Oswald Heer † noticed that some of the fir-cones from the Forest Bed bore marks which appeared to indicate that they had been gnawed by squirrels. The only additional, and quite doubtful, evidence of such an animal in the Cromerian fauna which Mr. Newton was able to record in 1882 was that of a humerus in the Green Collection from Ostend, Norfolk; this bone agrees closely in form with that of *S. vulgaris*, and it is not certain whether it came from the Forest Bed or from a recent alluvial deposit. Until the discovery to be described here was made, no further trace of a squirrel has been met with in the Forest Bed. A few years ago, when he was collecting from the thin bed known as the

\* Owen, Geol. Mag. dec. 1, vol. vi. p. 52 (1869).

† Newton, "Vertebrata of the Forest Bed," Mem. Geol. Survey, 1882, p. 92.

"Monkey Gravel" \*—the uppermost part of the Upper Freshwater-Bed at West Runton, Norfolk,—Mr. G. White was fortunate enough to find a minute tooth; its small size, yellowish colour, and form, resembling as it does a few agglutinated particles of the sand in which it was embedded, says much for the sharp sight of my friend. Mr. White very generously presented the specimen to me. It turns out to be the right  $\underline{P}^4$  of a squirrel. It differs importantly from the  $\underline{P}^4$  of *S. vulgaris*, and indicates a species which, when more fully known, will probably not be able to find a place within the genus *Sciurus* as restricted by modern mammalogists. For this Forest-Bed species I have pleasure in proposing the name of *S. whitei*.

In *S. vulgaris* (Pl. VIII. fig. 9) the outer border of  $\underline{P}^4$  is formed by the four cusps called by Winge 1, 4, 2, and 5; of these 4 and 5 are the largest and most lofty, 1 is nearly as stout though lower than either, while 2 is minute and on its way to disappear. The inner side of  $\underline{P}^4$  is formed by a single very large and lofty cusp (Winge's 6), which Forsyth Major† has shown to be a compound of at least three inner tubercles which have fused together. Between the outer cusps and the inner cone is a series of transverse ridges (formed out of a modified median series of tubercles, and comprising, *inter alia*, the "proto-" and "meta-conules"), viz., a low one forming the anterior border of the tooth from cusp 1, two higher ones from cusp 4, and the anterior edge of cusp 5 respectively, and a low one forming the posterior border from the hinder edge of 5; between these ridges are three transverse valleys, of which the central one, for the reception of the chief cusp of the opposed tooth, is the widest and deepest.

In the fossil (Pl. VIII. fig. 10) the same elements are present, but the transverse arrangement is less perfect. Cusp 1 is much smaller, as in some species of *Tamias*; it is compressed from before backwards, and prolonged inwards as a rounded ridge which dies out with the first transverse valley at a point less than halfway across the crown. The remainder of the front border of the tooth is formed by the "proto-conule," which here retains more of its tubercular character and independence, being more forwardly placed and separated from cusp 4 by a conspicuous cleft. Cusp 2, though very low, is stouter. The "meta-conule" is stouter and more independent; externally it is placed further back, the hinder trans-

\* Hinton, Geol. Mag. dec. 5, vol. v. p. 440.

† Forsyth Major, Proc. Zool. Soc. 1893, p. 182.

verse crest starting from its posterior part instead of from cusp 5. As a result of these differences the anterior and posterior transverse valleys are less extensive, the central one, on the other hand, wider and deeper than in *S. vulgaris*. Viewed from the front, the fossil is seen to be rather more brachyodont than the recent tooth. Like the latter, the fossil has three roots, viz., a large fang supporting the inner cone and two small ones on the outer side; in the fossil the outer fangs are of approximately equal size, but in *S. vulgaris*, owing to the greater size of cusp 1, the antero-external fang is stouter than the postero-external one. As the following dimensions show, the fossil is considerably smaller than the recent tooth :—

|  | <i>S. whitei</i> . | <i>S. vulgaris</i> . |
|--|--------------------|----------------------|
| Antero-posterior length, outer border .. | mm.<br>1·98        | mm.<br>2·25          |
| Transverse width (6-4) .....             | 2·2                | 2·42                 |

#### EXPLANATION OF PLATE VIII.

- Fig. 1. Castor veterior*, Lankester. Part of a right ramus, with  $\overline{p.4}$ ,  $\overline{m.1}$ , and  $\overline{m.2}$ , from the Red Crag of Woodbridge, Suffolk. Major Moore's collection. A, inner, B, outer view; C, crown view of cheek-teeth.
- Fig. 2. Castor plicidens*, Forsyth Major, from the Upper Freshwater Bed of West Runton, Norfolk. *a*, crown, *b*, basal view.
- Fig. 3. Castor* sp., from the Upper Freshwater Bed of West Runton. *a*, crown, *b*, basal view.
- Figs. 4 & 5. Trogontherium*. Lateral and sectional views of two young left upper incisors from the Upper Freshwater Bed of West Runton.
- Fig. 6. Trogontherium*. Left lower incisor from the Upper Freshwater Bed of West Runton. 6*a*. Posterior view of tip. 6*b*. Anterior view of tip. (6*a* and 6*b* much enlarged.)
- Fig. 7. Trogontherium cuvieri*, Fischer. Right navicular from the Upper Freshwater Bed, West Runton. A=proximal, B=distal, C=tibial, and D=fibular views. Facettes: *a*, astragalean; *c*, cuboid; III, II., and I., cuneiform. *n.t.*, naviculare tibiæ.
- Fig. 8. Castor fiber*, Linn. Right navicular from the alluvium of the Thames. Lettering as in fig. 7.
- Fig. 9. Sciurus vulgaris*, Linn. Right  $\overline{pm.4}$ , recent.  $\times 9$ .
- Fig. 10. Sciurus whitei*, sp. n. Right  $\overline{pm.4}$  from the Upper Freshwater Bed, West Runton.  $\times 9$ .

(Except where otherwise noted, all figures are of natural size.)

XVII.—*A new Dormouse from Northern Nigeria, presented to the British Museum by J. C. Fox, Esq. By GUY DOLLMAN.*

(Published by permission of the Trustees of the British Museum.)

*Graphiurus foxi*, sp. n.

A medium-sized species allied to *Graphiurus lorrainus*, Dollm., from which it is distinguished by its less richly coloured coat and smaller teeth.

Dimensions of body and hind feet greater than in *lorrainus*. General texture and length of hair as in the Welle River form. Colour of dorsal surface dull greyish brown; general effect as in *G. spurrelli*, Dollm. Dark rings around eyes not markedly developed. Cheeks greyish white, hairs with slate-grey bases and white tips. Backs of hands and feet dirty white. Ventral surface of body slate-grey, washed with white. Tail pale liver-brown.

Skull rather smaller than that of *lorrainus*, with narrower nasals and interorbital region; auditory bullæ less inflated and cheek-teeth considerably smaller.

Dimensions of the type (measured in the flesh):—

Head and body 83 mm.; tail 58; hind foot 13; ear 15.

Skull: greatest length 25·1; basilar length 18·7; condylo-incisive length 22; zygomatic breadth 14·2; interorbital constriction 3·7; squamosal breadth of brain-case 11·5; length of nasals 9·3; greatest width across nasals 2·8; palatilar length 7·7; length of palatal foramina 2·5; length of upper cheek-teeth 2·8.

*Hab.* Kabwir, Bauchi Province, Northern Nigeria. Altitude 2500 feet.

*Type.* Adult female. B.M. no. 13.5.15.1. Original number 58. Collected and presented by J. C. Fox, Esq.

This Nigerian dormouse is distinguished from its nearest ally, *G. lorrainus*, by its less richly coloured pelage and smaller cheek-teeth. The genus has not hitherto been recorded from Northern Nigeria; *G. hueti*, Roch., and *G. crassicaudatus dorotheæ*, Dollm., both members of very different groups, are the only other Nigerian species, and these do not appear to occur north of the Southern Nigerian boundary.

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XVIII.—*Descriptions of new Genera and Species of Noctuidæ.*  
By Sir GEORGE F. HAMPSON, Bart., F.Z.S.

[Concluded from p. 175.]

Genus *LOPHOCYTTARBA*, nov.

Type, *L. phænicoxantha*.

Proboscis aborted, minute; palpi upturned, slender, the second joint reaching to about middle of frons, the third short; frons smooth; eyes large, round; antennæ of male ciliated; thorax clothed almost entirely with scales and without crests; fore and mid tibiæ fringed with long hair; abdomen without crests. Fore wing with the apex rounded, the termen evenly curved and not crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form a minute areole; 11 from cell; a small tuft of scales in middle of cell and two on discocellulars. Hind wing with veins 3, 4 from angle of cell; 5 nearly fully developed from just below middle of discocellulars; 6, 7 from upper angle; 8 anastomosing with the cell near base only.

5406 a. *Lophocytarra phænicoxantha*, sp. n.

♂. Head, thorax, and abdomen dark purple-red tinged with blackish; pectus, legs, ventral surface of abdomen and anal tuft yellow, the fore legs black in front except the tarsi. Fore wing yellow, the base and costal area

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deep purple-red tinged in parts with black and irrorated with silver scales ; antemedial line indistinct, purplish pink on the yellow area, excurved ; a tuft of black and silver scales in middle of cell and two on discocellulars ; some purple-pink in and beyond end of cell, and an incurved band from lower angle to inner margin ; postmedial line yellow defined on outer side by purplish pink, bent outwards below costa, slightly incurved at discal fold, below vein 3 forming a broad waved incurved band, some yellow points beyond it on costa ; subterminal line only defined by some purple-pink beyond its medial part, forming a spot at middle of terminal area ; a terminal series of purplish-pink points. Hind wing purplish pink irrorated with silvery scales, the terminal area yellow ; rather diffused dark curved antemedial, medial, and postmedial lines and a dark discoidal bar ; a terminal series of purplish-pink points ; the underside whitish.

*Hab.* NATAL, Durban (*Leigh*), 1 ♂ type. *Exp.* 22 mm.

5430 a. *Corgatha inflammata*, sp. n.

♂. Head and tegulae yellow suffused with fiery red ; thorax fiery red with some silvery scales ; pectus and legs yellow, the fore legs crimson with some yellow and brown hair on fore femora and the tarsi yellow ; abdomen fiery red with some silvery scales, the ventral surface yellow. Fore wing yellow almost entirely suffused with fiery red and irrorated with some fuscous and silvery scales, the medial part of costa, a patch in middle of cell, and a patch beyond costal part of postmedial line yellow ; a subbasal yellow striga from costa ; antemedial line defined on outer side by a red striga from costa on the yellow area, yellow and excurved below the cell ; traces of a dark medial shade ; postmedial line red defined on outer side by yellow and on inner side also below costa, minutely dentate, excurved to vein 4, then incurved, some yellow points beyond it on costa ; subterminal line represented by faint yellow marks, somewhat excurved below vein 7 and at middle ; cilia chequered red and yellow. Hind wing with the basal half yellow with some fiery red and blackish irroration below end of cell, the terminal half fiery red with some silvery irroration ; diffused fiery-red subbasal and medial lines ; postmedial line fiery red defined on outer side by yellow, dentate, angled inwards at discal fold and excurved at middle ; subterminal line represented by some small yellow spots ; cilia chequered red and yellow ; the underside yellow, a slight brownish

discoïdal spot, a sinuous pale red postmedial line, the terminal area suffused with pale red and the termen with fuscous.

*Hab.* DUTCH N. GUINEA, Oetakwa R., Snow Mts. (*Meek*), 1 ♂ type. *Exp.* 22 mm.

5430 *b.* *Corgatha poliostrata*, sp. n.

♀. Head and thorax purplish red-brown, the vertex of head and antennæ towards base white; abdomen dark purplish brown mixed with some grey; pectus, legs, and ventral surface of abdomen whitish mixed with brown. Fore wing purplish brown tinged with grey, the costal and postmedial areas white irrorated with brown; a narrow antemedial white band; a whitish discoïdal spot; postmedial line indistinctly double, dark filled in with whitish, oblique to vein 6, slightly incurved at discal fold, incurved below vein 4; the costa beyond it tinged with brown and with two white points; subterminal line only defined by the dark terminal area and the brownish on costa before it, angled inwards at discal fold and excurved at middle; a blackish terminal line. Hind wing purple-brown with some grey and fuscous irroration; traces of an oblique sinuous whitish antemedial line and of a sinuous whitish subterminal line; a blackish terminal line; the underside grey tinged with brown.

*Hab.* GOLD COAST, Bibianaha (*Spurrell*), 1 ♀ type. *Exp.* 18 mm.

5430 *c.* *Corgatha emarginata*, sp. n.

Fore wing with the apex produced and acute, the termen oblique and sinuous below vein 3; hind wing with the termen oblique to vein 3 where it is strongly excurved; tibiæ of male fringed with long hair.

♂. Head, thorax, and abdomen bright rufous mixed with yellow, the last with the ventral surface yellow. Fore wing yellow irrorated with rufous and blackish, the costal area suffused with rufous and irrorated with a few silvery scales; antemedial line rufous, curved; a faint rufous spot in cell towards extremity and a faint oblique dark medial shade; the terminal half of costal edge black with some white points on it; postmedial line rufous, oblique and almost straight from below costa to inner margin; a faint waved rufous subterminal line, excurved at middle; a rufous terminal line with a series of black points on it. Hind wing yellow suffused with bright rufous and slightly irrorated with black; a small black discoïdal spot on an

oblique dark shade; postmedial line rufous, oblique, straight; a diffused waved rufous subterminal line, excurved at middle; a rufous terminal line and series of black points; the underside yellow, a black discoidal spot and rufous postmedial line, the termen suffused with fuscous black to vein 4, then with black striæ.

*Hab.* DUTCH N. GUINEA, Snow Mts., Oetakwa R. (*Meek*), 1 ♂ type. *Exp.* 22 mm.

5525 a. *Angitia flavidorsum*, sp. n.

♀. Head and thorax yellow, mixed with red-brown; abdomen yellow tinged with rufous and suffused with red-brown at side. Fore wing red-brown irrorated with yellow especially on medial part of costal area; an irregular yellow patch at base with a black spot on its outer edge; double subbasal black striæ filled in with yellow from costa; antemedial line double, black-brown filled in with yellowish, sinuous, excurved above inner margin; orbicular defined at sides by yellow bars; reniform with a yellow bar on inner edge and a yellow spot with white spots above it and two below it on outer; a dark striga from middle of costa and an oblique waved line from lower angle of cell to inner margin; postmedial line double, dark brown filled in with yellow, strongly bent outwards below costa, then minutely waved, slightly incurved at discal fold and oblique below vein 4, some whitish points beyond it on costa; subterminal line yellow, interrupted, defined on inner side by dark brown suffusion and somewhat dentate marks at middle, minutely waved, excurved at vein 7 and middle, and bent inwards at veins 5 and 3, a small yellow spot beyond it at discal fold; a terminal series of small black-brown lunules slightly defined by yellowish; cilia bright yellow with red-brown patches at apex and middle. Hind wing red-brown, the cilia bright yellow, red-brown at tips towards apex; the underside whitish irrorated with red-brown, the apical area suffused with red-brown and a red-brown patch at tornus, a red-brown discoidal spot and crenulate postmedial line defined on outer side by white.

*Hab.* PANAMA, La Chorrera (*Dolby-Tyler*), 1 ♀; BR. GUIANA (*Kaye*), 1 ♀ type. *Exp.* 30 mm.

5535 a. *Angitia esmeralda*, sp. n.

♀. Head and thorax emerald-green mixed with red-brown, the vertex of head and tegulæ with some whitish; pectus and legs white tinged with red-brown; abdomen

brown mixed with yellow and with yellow dorsal stripe, the crests and extremity of anal tuft emerald-green. Fore wing emerald-green thickly pencilled with dark brown and slightly irrorated with black; a basal green patch with black spot at its lower extremity; antemedial line dark brown, oblique, sinuous; orbicular with green bars defined by blackish at sides; reniform with green bar defined by blackish on inner side, its outer edge with white point at upper extremity and two at lower; an oblique dark line from lower angle of cell to inner margin; postmedial line double, dark brown filled in with green, strongly bent outwards below costa, then minutely waved, slightly incurved at discal fold and oblique below vein 4, some white points beyond it on costa; subterminal line green defined on inner side by small dentate black marks between veins 7 and 3, minutely waved, bent outwards at vein 7 and middle, a blackish spot beyond it on discal fold; a terminal series of small blackish lunules slightly defined by green; cilia green mixed with brown towards apex and at middle. Hind wing red-brown, the cilia green with a brown line through them towards apex; the underside green irrorated with brown especially on terminal area, a brown line from costa to lower angle of cell and crenulate postmedial line.

*Hab.* TRINIDAD, Caparo (*Kaye*), 1 ♀ type. *Exp.* 30 mm.

5536 a. *Angitia poliosema*, sp. n.

♂. Head and thorax yellow-green mixed with red-brown, the metathorax with green patch; abdomen yellow-green mixed with red-brown and with a green patch at base of dorsum, the ventral surface yellow with sublateral and ventral series of small dark spots. Fore wing yellow-green irrorated with red-brown; an indistinct double brown subbasal line filled in with green from costa to a green mark below base of cell; antemedial line double, brown filled in with green and defined on inner side by a red-brown band, from costa to vein 1, slightly waved; orbicular defined at sides by green and red-brown; reniform with incomplete green annulus defined by red-brown and green centre defined by red-brown; an incurved red-brown shade from lower angle of cell to inner margin; a grey patch irrorated with brown beyond lower angle of cell; postmedial line double, dark brown filled in with green, bent outwards below costa, then waved, incurved at discal fold and below vein 4, some dark brown suffusion beyond it and some green points on costa; subterminal line

green defined on inner side by red-brown, waved, excurved at vein 7 and middle and bent inwards at veins 5 and 3, some dark red-brown beyond it towards apex and spots below veins 5 and 3; a terminal series of small dark brown lunules defined by green. Hind wing red-brown, the inner half of termen with slight dark lunules defined by green, a green bar above tornus; cilia green, red-brown at tips towards apex; the underside whitish irrorated with red-brown, the terminal area suffused with red-brown, a red-brown discoidal spot and diffused crenulate postmedial line defined on outer side by white.

*Hab.* BR. GUIANA (*Roberts*), 1 ♂ type. *Exp.* 28 mm.

5583 a. *Phyllophila atripars*, sp. n.

♂. Head and thorax grey tinged with brown and irrorated with black, black streaks on vertex of head and upper edges of tegulae and patagia, the dorsum of thorax black; pectus, legs, and abdomen brownish grey irrorated with black, the last dorsally suffused with brown. Fore wing grey suffused with brown and irrorated with black, the costal area paler with black streaks on the veins; a black fascia below median nervure; orbicular black, small, round; reniform defined by black, narrow, elliptical; postmedial line black, obsolescent towards costa, strongly excurved to vein 4, then bent inwards to below end of cell and oblique and sinuous to inner margin; subterminal line blackish, excurved, and waved to vein 3, then bent inwards; an oblique black shade from apex to vein 6, then between the postmedial and subterminal lines to vein 3; a terminal series of black points; cilia with a black line at middle. Hind wing grey tinged and irrorated with brown, the terminal area suffused with brown; a black discoidal spot and fine terminal line; cilia grey with a black line at middle; the underside brownish white strongly irrorated with black, a black discoidal lunule.

Ab. 1. Fore wing with the costal area black to the subterminal line extending to the fascia below the cell.

*Hab.* BR. E. AFRICA, Nairobi (*Anderson*), 6 ♂. *Exp.* 30 mm.

P. 378. Genus *Xantholeuca*, Hmps., nec Seph. Lep. 1831.  
Rename CHIONOXANTHA.

P. 479. PRASINOPYRA, n. n. for *Chlorhoda*, nec Hmps.  
Lep. 1901.

P. 487. Genus *Xanthozona*, Hmps., nec Townsend,  
Dipt. 1908. Rename XANTHOMERA.

5601. *Ozarba flavicilia*, sp. n.

♂. Head and thorax black-brown; palpi, pectus, and legs yellow mixed with black-brown, the tarsi black-brown ringed with yellow; abdomen fuscous brown, the anal tuft and lateral stripes yellow, the ventral surface yellow irrorated with blackish. Fore wing black-brown with a slight purplish-grey gloss; antemedial line indistinct, double, blackish, dentate, with two orange striæ at costa; medial line indistinct, blackish, waved; a straight pale yellow post-medial band, defined at sides by black and with diffused rufous line towards outer edge, some yellow points beyond it on costa; subterminal line indistinct, diffused, blackish, irregularly dentate, incurved at discal fold and below vein 3; a terminal series of black points. Hind wing dark brown with a cupreous gloss; cilia yellow except at apex; the underside black irrorated with whitish, some yellow at base of costa and on termen except towards apex and tornus.

*Hab.* UGANDA, Entebbe (*Neave*), 1 ♂ type. *Exp.* 26 mm.

5605 a. *Ozarba orthogramma*, sp. n.

♀. Head and thorax greyish brown; abdomen pale grey-brown; pectus, legs, and ventral surface of abdomen whitish suffused with brown, the tarsi black ringed with white. Fore wing greyish brown with a slight cupreous tinge; antemedial line dark brown defined on each side by whitish, erect and slightly sinuous; a slightly incurved blackish medial line defined on inner side by some whitish scales and with a dark brown band beyond it, narrow at costa, widening to inner margin; an oblique white striga across end of cell and two minute black and white points beyond upper angle; postmedial line dark brown defined on each side by whitish, erect, straight, a patch of dark brown suffusion beyond it from below costa to vein 5; traces of a sinuous whitish sub-terminal line, incurved at submedian fold; a fine blackish terminal line defined on inner side by whitish. Hind wing brown with a cupreous gloss; the underside brown irrorated with whitish, indistinct curved dark postmedial and sub-terminal line, a fine waved blackish terminal line with whitish marks before it.

*Hab.* N. NIGERIA, Minna (*Macfie*), 2 ♀ type. *Exp.* 24 mm.

5678 a. *Ozarba leptocyma*, sp. n.

♂. Head and tegulæ dark brown mixed with ochreous; thorax dark brown mixed with grey; pectus and legs ochreous

mixed with brown, the tarsi blackish ringed with ochreous; abdomen dark brown, the ventral surface irrorated with grey. Fore wing purplish grey, the terminal area dark brown; a slight dark subbasal line from costa to submedian fold; antemedial line double, dark, sinuous, defined on inner side by pinkish towards costa; a sinuous dark medial line excurved at median nervure and with band of dark suffusion beyond it; a pinkish white discoidal striga; postmedial line double, dark filled in with grey and defined on outer side by grey, slightly incurved at discal and submedian folds, some pale points beyond it on costa; a slight greyish subterminal line somewhat excurved below vein 7 and at middle; a blackish terminal line defined on inner side by slight whitish lunules. Hind wing dark brown with a cupreous gloss; the underside slightly irrorated with grey.

*Hab.* N. NIGERIA, Minna (*Macfie*), 2 ♂ type, Zungeru, 1 ♂. *Exp.* 18 mm.

5760 a. *Lithacodia mesomela*, sp. n.

Head and thorax grey-white mixed with rufous and some blackish; antennæ and palpi blackish; abdomen grey-white mixed with dark brown, the crest on third segment blackish. Fore wing with the basal area and the costal area and cell to the reniform whitish suffused with rufous; a subbasal black point in the cell; antemedial line slight, double, incurved in cell, oblique and filled in with white below the cell; the inner half of medial area black-brown; a black point in middle of cell; reniform elliptical with white annulus defined by black, its centre white above, fuscous below, and incompletely defined by black; postmedial line double and filled in with white, excurved below costa, then forming the outer edge of reniform, incurved and waved below it; the terminal area whitish suffused with brown; subterminal line whitish defined on inner side irregularly by black, dentate at veins 7, 6, 4, 3, 2 and incurved at discal fold; an oblique blackish mark from apex; a punctiform blackish terminal line; cilia with dark lines at middle and tips. Hind wing reddish brown; a fine dark terminal line; cilia whitish with a dark line through them; the underside whitish tinged with ochreous and irrorated with fuscous; a blackish discoidal spot, minutely waved postmedial line, indistinct waved subterminal line, and terminal series of black striae.

*Hab.* BR. E. AFRICA, Nairobi (*Anderson*), 1 ♂, 4 ♀ type. *Exp.*, ♂ 18, ♀ 20 mm.



## Genus ARGYROLOPHA, nov.

Type, *A. costibarbata*.

Proboscis fully developed; palpi upturned, the second joint reaching to vertex of head and with tuft of hair behind at extremity, the third moderate and with tuft of hair behind; frons smooth; eyes large, round; antennæ of male with fasciculate cilia; thorax clothed almost entirely with scales and without crests; tibiæ slightly fringed with hair; abdomen with dorsal series of crests except at base. Fore wing with the apex rounded, the termen evenly curved and crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 and 10 anastomosing with 8 to form the areole; 11 from cell; male with a fringe of hair and scales from below costa recurved over upper surface of wing. Hind wing with veins 3, 4 from angle of cell; 5 nearly fully developed from just below middle of discocellulars; 6, 7 from upper angle; 8 anastomosing with the cell near base only.

In key differs from *Micrantha* in the palpi being upturned.

5747 *b. Argyrolopha costibarbata*, sp. n.

Head, thorax, and abdomen bright red-brown mixed with blackish; antennæ and third joint of palpi except at tips black; fore tibiæ and tarsi black with slight pale rings; abdomen with the crests black glossed with silver. Fore wing bright red-brown irrorated with black; a diffused black band before the minutely waved black antemedial line; two waved medial lines with blackish suffusion between them; a small black discoidal lunule; postmedial line black defined on outer side by reddish ochreous, minutely dentate, excurved to vein 4, then incurved, a triangular blackish patch beyond it on costal area with some ochreous points on the costa; an indistinct ochreous subterminal line excurved below vein 7 and at middle; a crenulate black terminal line forming points in the interspaces. Hind wing bright red-brown irrorated with blackish; sinuous black medial and postmedial lines, the latter with ochreous patch beyond it in submedian interspace; an indistinct pale curved subterminal line defined on outer side by blackish; a crenulate black terminal line forming points at the interspaces; the underside whitish irrorated with brown, sinuous dark medial and postmedial lines, and terminal series of small lunules.

*Hab.* MAURITIUS, Curepipe (*Tullock*), 1 ♂, 2 ♀ type. *Exp.* 24 mm.

5747 d. *Artigisa melanephele*, sp. n.

Head, thorax, and abdomen bright red-brown mixed with some black scales, the last with subdorsal silvery-white bars on third segment; pectus, legs, and ventral surface of abdomen ochreous, the fore and mid tibiae and tarsi banded with black. Fore wing bright red-brown irrorated with black; a black subbasal striga from costa; a blackish band with waved edges before the black antemedial line which is somewhat dentate and interrupted and angled outwards below median nervure; a black point in middle of cell; reniform with slight pale outline and its centre defined by some blackish; an indistinct dark medial line excurved in the cell to the reniform, then incurved; postmedial line black defined on outer side by ochreous with a black shade beyond it from vein 5 to inner margin forming a patch between veins 5 and 3, the line excurved below costa, then dentate, and incurved below vein 4, some reddish-ochreous points with black streaks between them beyond it on costa; subterminal line reddish ochreous defined on outer side by blackish, curved, dentate; a series of black striae before termen and a small patch at middle; a waved black terminal line. Hind wing bright red-brown irrorated with some black; a discoidal spot defined at sides by black bars; two indistinct sinuous lines beyond the cell, defined on outer side by reddish ochreous; postmedial line black defined on outer side by reddish ochreous, rather lunulate, incurved at submedian fold, a blackish patch beyond it between veins 4 and 2; subterminal line reddish ochreous defined on outer side by blackish, waved and sinuous; a series of black striae before termen and small patches at middle and submedian fold, a waved black terminal line; the underside ochreous irrorated with fuscous; a black discoidal lunule with pale centre, sinuous postmedial line, subterminal shade, a series of black striae before termen.

*Hab.* TASMANIA (R. M. Green), 1 ♂, 3 ♀ type. *Exp.* 34-42 mm.

4757 i. *Artigisa terminalis*, sp. n.

♀. Head, thorax, and abdomen reddish ochreous mixed with dark red-brown; antennae and third joint of palpi dark brown. Fore wing reddish ochreous irrorated with dark red-brown, the area beyond the postmedial line dark red-brown; a curved ochreous subbasal line with a dark band beyond it before the antemedial line which is dark defined on inner side by ochreous, waved; a minute dark brown spot

in middle of cell; medial line dark brown, bent outwards in cell, then sinuous; postmedial line slight, dark brown with dark points on it at discal and submedian folds, minutely waved, oblique to vein 4 and incurved below vein 2, some slight pale points beyond it on costa; subterminal line indistinct, pale, angled outwards at vein 7 and excurved at middle; a series of small obscure dark spots before termen and a punctiform terminal line. Hind wing ochreous suffused and thickly irrorated with dark red-brown; a red-brown discoidal spot; an indistinct sinuous medial line; postmedial line dark brown defined on outer side by ochreous, somewhat dentate, excurved beyond lower angle of cell; an indistinct pale waved subterminal line and a series of dark striæ before termen; the underside ochreous tinged with brown, a brown discoidal spot and sinuous postmedial line.

*Hab.* BORNEO, Sandakan (*Pryer*), 1 ♀ type. *Exp.* 26 mm.

5747 l. *Panilla homospila*, sp. n.

♂. Head, thorax, and abdomen red-brown mixed with ochreous and some dark scales; legs with some purplish-pink hair; tarsi blackish with pale rings; ventral surface of abdomen ochreous. Fore wing purplish red-brown mixed with some greyish ochreous; antemedial line dark slightly defined on inner side by ochreous, waved; a blackish point in middle of cell; medial line blackish, excurved in cell and waved below it; postmedial line slight, dark defined on outer side by greyish followed by a wedge-shaped blackish shade from costa to a rather bifid black patch at middle, the line slightly waved, oblique to discal fold and incurved below vein 4, some black and pale points beyond it on costa; subterminal line greyish, excurved below costa, then oblique and touching the bifid patch; a series of black points before termen and a fine waved black terminal line. Hind wing purplish red-brown mixed with some greyish ochreous; a slight sinuous dark medial line with a discoidal striga beyond it; postmedial line black, punctiform, stronger towards inner margin and excurved beyond lower angle of cell; a series of slight dark points before termen and a fine waved dark terminal line; the underside greyer brown with the markings indistinct.

*Hab.* BORNEO, Sandakan (*Pryer*), 1 ♂ type. *Exp.* 28 mm.

5747 o. *Panilla diagramma*, sp. n.

♀. Head, thorax, and abdomen whitish mixed with black and some deep red, the frons and tegulæ with more black,

the metathorax with black patch; pectus, legs, and ventral surface of abdomen ochreous whitish. Fore wing ochreous whitish suffused with red-brown and irrorated with blackish, the costa with antemedial, medial, and postmedial blackish patches; antemedial line blackish defined on inner side by ochreous white, angled inwards in the cell and on vein 1 and outwards just below median nervure; a black point defined by whitish in middle of cell; reniform with dark outline defined by whitish, rather inverted comma-shaped; a double very oblique medial line from vein 5 to inner margin; postmedial line black defined on outer side by whitish, very oblique to vein 6, then minutely dentate to vein 4, then again very oblique, the blackish patch beyond it on costa triangular; subterminal line whitish, indistinct, and somewhat dentate to vein 4, then oblique and angled outwards at vein 1; a fine crenulate black terminal line. Hind wing ochreous whitish irrorated with black scales on basal area, then suffused with dark brown; a small blackish discoidal annulus; medial line blackish defined on outer side by whitish, oblique; postmedial line black defined on each side by whitish, oblique; a white subterminal line, oblique from below apex; a punctiform black terminal line; the underside whitish irrorated with brown, a black discoidal annulus, and waved medial and postmedial lines.

*Hab.* GOLD COAST, Bibianaha (*Spurrell*), 1 ♀ type. *Exp.* 20 mm.

5747 *q.* *Panilla hemicausta*, sp. n.

♀. Head and thorax dark purplish brown; palpi ochreous towards tips; pectus mostly ochreous; tarsi dark brown with pale rings; abdomen ochreous with some purple-red towards base and diffused dark bands towards extremity, the ventral surface ochreous. Fore wing with the basal and terminal areas purple-brown mixed with some red, the medial area ochreous tinged with purplish red and suffused with brown on its basal half; antemedial line slight, dark, slightly defined on inner side by ochreous, minutely waved, an indistinct sinuous dark medial line; postmedial line slight, red defined on outer side by ochreous, oblique to vein 6, angled inwards to a black point at discal fold, oblique and minutely dentate below vein 4 and with two black points in submedian interspace, some pale points beyond it on costa; traces of a waved greyish subterminal line; a slight lunulate blackish terminal line. Hind wing ochreous irrorated with red, the terminal area purple-brown mixed with some red; a

waved blackish medial line with some deep red beyond it on inner half ; postmedial line dark, angled inwards and forming a black wedge-shaped patch at discal fold, sinuous and with black spots on it below vein 4 ; traces of an ochreous subterminal line ; a lunulate blackish terminal line ; the underside ochreous, the medial and postmedial lines and terminal area dark brown.

*Hab.* GOLD COAST, Bibianaha (*Spurrell*), 1 ♀ type. *Exp.* 28 mm.

5747 r. *Panilla poliochroa*, sp. n.

♂. Head, thorax, and abdomen violaceous grey mixed with some black scales ; pectus and legs brownish white. Fore wing violaceous grey slightly irrorated with blackish, a blackish subbasal patch defined by whitish on costa and antemedial black points in and below the cell ; a double waved blackish medial line ; postmedial line black, minutely waved, excurved, a black patch beyond it at middle ; subterminal line whitish, sinuous, from costa to the black patch ; a series of black points before termen and blackish patch at middle, and a fine waved black terminal line. Hind wing violaceous grey irrorated with blackish ; a sinuous blackish medial line excurved round an obscure discoidal annulus ; postmedial line black, minutely dentate, angled inwards at discal fold ; a faint diffused subterminal line ; a series of black points before termen connected with a fine waved black terminal line ; the underside whitish suffused with brown and with waved medial and postmedial lines.

*Hab.* N. BORNEO, Mt. Marapok, 1 ♂ type. *Exp.* 18 mm.

5747 t. *Panilla subbasalis*, sp. n.

♂. Head, thorax, and abdomen whitish tinged with purplish red and with some black scales ; antenna black ; mid tibiæ with the hair deep red-brown. Fore wing whitish suffused with violaceous brown and some red and irrorated with blackish ; a rather broad subbasal black band ; a small dark discoidal spot narrowing above ; postmedial line indistinct, dark, oblique to vein 5, then inwardly oblique and somewhat dentate, a quadrate blackish patch beyond it on costal area ; traces of a dark postmedial line excurved at middle ; a terminal series of blackish points. Hind wing whitish suffused with purplish red and irrorated with blackish ; an oblique black line from lower angle of cell to inner margin ; postmedial line black, excurved beyond the cell ; a blackish subterminal line, excurved at middle ; a waved

blackish terminal line; the underside whitish tinged with brown, the markings indistinct.

*Hab.* GOLD COAST, Bibianaha (*Spurrell*), 1 ♂ type. *Exp.* 26 mm.

5762 a. *Lithacodia pyrophora*, sp. n.

♀. Head and thorax white tinged with rufous; antennæ brown; pectus and legs ochreous white, the fore tibiæ and the tarsi fuscous ringed with white; abdomen ochreous irrorated with fuscous, the crest on third segment black, the anal segment with blackish subdorsal patches. Fore wing with the basal area white tinged with pale rufous and bounded by the obliquely curved dark antemedial line; a brown subbasal striga from costa; the rest of wing dark brown; a semielliptical white patch on postmedial part of costa with a fiery-red patch on its outer side defined by a white striga from costa; the slight curved very minutely waved postmedial line arising from the costal patch, whitish defined by blackish and with a diffused black patch beyond it below the red patch; a black apical spot and traces of a pale sinuous subterminal line; a fine yellowish line at base of cilia. Hind wing pale ochreous brown; cilia yellowish with a brown line near base; the underside yellowish irrorated with brown, rather diffused curved dark medial and postmedial lines, and a terminal series of black points.

*Hab.* BR. C. AFRICA, Nyasaland (*Old*). 1 ♀ type. *Exp.* 20 mm.

5812 a. *Lithacodia griseifusa*, sp. n.

♀. Head, thorax, and abdomen brown mixed with grey; palpi with the second and third joints white at extremities; pectus, legs, and ventral surface of abdomen whitish tinged with brown. Fore wing brown mixed with grey-white, the medial area brown; subbasal line double, dark filled in with whitish, from costa to submedian fold; antemedial line double, dark filled in with whitish and defined on inner side by whitish, waved; orbicular a small whitish annulus with dark centre; reniform small, whitish, elliptical, with two dark points in centre; postmedial line double, dark filled in with whitish and defined on outer side by whitish, bent outwards below costa, then minutely waved, excurved to vein 4, then oblique, some white points beyond it on costa; subterminal line whitish, excurved below vein 7 and at middle; a terminal series of black points. Hind wing grey-brown; a fine dark terminal line; cilia whitish mixed with brown;

the underside whitish irrorated with brown, a small blackish discoidal spot, curved sinuous postmedial line, and diffused subterminal line.

*Hab.* N. NIGERIA, Minna (*Macfie*), 2 ♀ type. *Exp.* 18 mm.

5832 *b. Lithacodia plumbifusa*, sp. n.

♀. Head and thorax black-brown suffused with leaden grey; pectus, legs, and abdomen greyish brown. Fore wing black-brown suffused with leaden grey; antemedial line grey defined on outer side by brown suffusion, waved; orbicular and reniform absent; postmedial line greyish defined on inner side by brown suffusion, somewhat oblique towards costa, then dentate, incurved in submedian interspace; subterminal line indistinct, diffused, dark brown, excurved below costa and at middle and incurved at discal fold and below vein 3; a terminal series of black points. Hind wing greyish suffused with glossy brown.

*Hab.* N. NIGERIA, Minna (*Macfie*), 1 ♀ type. *Exp.* 16 mm.

Genus CALLOSTROTIA, nov.

Type, *C. flavizonata*.

Proboscis fully developed; palpi upturned, the second joint reaching to vertex of head and moderately scaled, the third rather long; frons with rounded prominence; eyes large, round; antennæ of male ciliated; thorax clothed almost entirely with scales, the metathorax with depressed crest; abdomen with basal crest only. Fore wing rather long and narrow, the termen evenly curved and not crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form a minute areole; 11 from cell. Hind wing with veins 3, 4 from angle of cell; 5 nearly fully developed from above angle; 6, 7 from upper angle; 8 anastomosing with the cell near base only.

5848 *a. Callostrotia flavizonata*, sp. n.

♂. Head and thorax black mixed with yellow; antennæ yellowish with a black line between their bases; abdomen black with yellow segmental lines, the extremity yellow. Fore wing with the base black with some yellow and silvery scales; a yellow subbasal striga from costa; a yellow antemedial band with sinuous edges; medial area black irrorated with yellow and silvery scales; a small yellow spot in middle

of cell and yellow discoidal striga; postmedial line yellow, expanding into a patch at costa, excurved at middle; postmedial area black irrorated with yellow and silvery scales and with some yellow points at costa; subterminal line yellow, nearly straight, defined on outer side by black suffusion except towards tornus; the termen yellow with a series of black points. Hind wing yellowish suffused with black-brown leaving the termen yellowish; a yellow postmedial bar from costa; a terminal series of black points; the underside yellow suffused with black, the inner area yellowish, a sinuous yellow postmedial band, and a series of small yellow spots in the interspace before termen.

*Hab.* N. NIGERIA, Zungeru (*Macfie*), 1 ♂ type. *Exp.* 20 mm.

5884 a. *Eustrotia expatriata*, sp. n.

♀. Head, thorax, and abdomen grey-brown; pectus, legs, and ventral surface of abdomen whitish, the tibiae and tarsi fuscous ringed with white. Fore wing with the basal half grey-brown, the terminal half pale purplish red-brown with the termen greyer; slight black subbasal and antemedial marks on costa; a deep chocolate-brown medial band edged by black lines and with silvery lines just before and beyond it, slightly excurved below costa and incurved just below the cell, a faint dark line beyond it incurved between veins 5 and 1; a few blackish scales on discocellulars; some black points on postmedial part of costa; a greyish subterminal line, slightly excurved at middle, a terminal series of black striae. Hind wing grey tinged with red-brown; the underside whitish irrorated with brown.

*Hab.* N. NIGERIA, Zungeru (*Macfie*), 2 ♀ type. *Exp.* 18 mm.

5904 a. *Eustrotia atrivitta*, sp. n.

♂. Head and thorax ochreous whitish mixed with dark brown; palpi with the second and third joints banded with blackish; sides of frons black; fore femora blackish in front, the tibiae and tarsi banded black and white; abdomen ochreous with obscure dorsal brown bands. Fore wing white tinged with ochreous and irrorated with brown; patches of dark suffusion on basal and medial costal areas and in cell, separated by an oblique white band from costa to the obscurely defined white orbicular stigma; reniform white partly defined by black and with some brown irroration in centre, met by an oblique white shade from costa with an



oblique dark shade beyond it from apex; a black fascia between orbicular and reniform; postmedial line slight, double, dark filled in with white, bent outwards below costa, excurved to vein 4, then oblique and slightly waved; a fine black terminal line expanding into patches at middle and submedian fold, some white suffusion before it towards apex. Hind wing ochreous white tinged with brown; a fine brown terminal line; the underside ochreous white irrorated with brown, a slight brown discoidal stigma and traces of sinuous postmedial and subterminal lines.

*Hab.* BR. E. AFRICA, N. Kavirondo, Maramas Distr., Ilala (*Neave*), 1 ♂ type. *Exp.* 20 mm.

5915 a. *Eustrotia nephrostricta*, sp. n.

♂. Head and thorax grey-white tinged with reddish brown and mixed with black-brown; palpi black except at base; pectus and legs whitish tinged with brown, the fore tibiæ blackish, the tarsi blackish with pale rings; abdomen grey-white suffused with brown, leaving pale segmental lines. Fore wing grey-white tinged with brown and irrorated with blackish; an oblique whitish subbasal bar from costa with a brown spot before it and a brown patch beyond it extending to median nervure; antemedial line slight, dark, curved, and minutely waved, a small black spot beyond it representing the claviform; orbicular and reniform large, whitish defined by blackish, the former with whitish spot above it on costa, the latter extending to well below the cell and with a whitish spot above it on costa with a brown patch before it; postmedial line indistinct, obliquely excurved from costa to vein 6, then forming slight whitish dark-defined lunules, some whitish points beyond it on costa; subterminal line whitish defined on inner side by brown suffusion, minutely waved, excurved below vein 7 and angled inwards at vein 2, the interspaces beyond it with slight black streaks ending in minute terminal black lunules. Hind wing whitish suffused with brown; a fine dark terminal line.

*Hab.* BR. E. AFRICA, Nairobi (*Anderson*), 1 ♂ type. *Exp.* 28 mm.

5921 a. *Eustrotia sectirena*, sp. n.

♂. Head white; antennæ brown; palpi brown except at tips; tegulæ red-brown; thorax white slightly mixed with red-brown; legs banded with dark brown; abdomen white suffused with dark brown. Fore wing white suffused with rufous; a slight oblique blackish subbasal line from costa

to vein 1; antemedial and medial blackish striæ from costa; reniform interrupted at discal fold, the upper and lower parts white defined by blackish; postmedial line dark slightly defined on outer side by white, bent outwards below costa, excurved to vein 4, then oblique, some white points beyond it on costa; a white apical patch with a dark shade before it, the terminal area with dark suffusion from below the apical patch to tornus; a terminal series of blackish points. Hind wing whitish suffused with red-brown; the underside whitish irrorated with brown, a slight brown discoidal striga and indistinct curved postmedial line.

*Hab.* GOLD COAST, Bibianaha (*Spurrell*), 1 ♂ type. *Exp.* 18 mm.

5941 a. *Eulocastra tarachodes*, sp. n.

♀. Head and thorax ochreous white; palpi and antennæ brown; tegulæ with brown patches; pectus in front, fore legs, and hind tibiæ brown, the tarsi dark brown with pale rings; abdomen brown, the ventral surface ochreous. Fore wing ochreous white; the costa brown towards base; a sub-basal brown striga from costa and some brown on inner margin; antemedial line brown, slightly curved, arising from a brown spot on costa; two black discoidal points with a brown patch irrorated with blue-grey above it on costa; the area beyond the cell olive-brown slightly irrorated with blue-grey, its inner edge angled outwards beyond lower angle of cell, then oblique and sinuous; postmedial line creamy white, strong towards costa, angled outwards at veins 6 and 4, then incurved and slight, a white striga before it above inner margin; subterminal line white and dentate from costa to vein 4, with blackish streaks beyond it in the interspaces, then obsolete; a terminal series of white points. Hind wing brown; a fine pale line at base of cilia; the underside ochreous tinged with brown, slight brown medial, postmedial, and subterminal lines, the postmedial line minutely dentate, a terminal series of dark striæ.

*Hab.* GOLD COAST, Bibianaha (*Spurrell*), 1 ♀ type. *Exp.* 26 mm.

5950 a. *Eulocastra argyrogramma*, sp. n.

♀. Head yellow irrorated with dark brown; antennæ brown ringed with yellow towards base; thorax black-brown with some yellow; pectus and legs yellow mixed with blackish, the fore tibiæ and the tarsi banded black and yellow; abdomen black-brown, the anal tuft yellow, the ventral

surface irrorated with whitish. Fore wing black-brown irrorated with silvery grey; antemedial line indistinct, black defined on inner side by yellow to submedian fold, where the yellow is produced towards base as a short streak, slightly angled outwards below costa, then sinuous; a small silvery spot in upper part of middle of cell and discoidal bar; post-medial line with yellow spot at costa, then silvery and minutely dentate, incurved and almost obsolete at discal fold and incurved at submedian fold, some yellow points beyond it on costa; subterminal line silvery, minutely dentate, excurved below vein 7 and at middle; a terminal series of minute black spots with yellow spots between them; cilia yellow towards apex, at middle, and towards tornus. Hind wing black-brown with a cupreous gloss; cilia yellow, chequered with black-brown to vein 2; the underside slightly irrorated with whitish, a small whitish postmedial spot on costa and minute subterminal streaks on veins 5 and 4.

*Hab.* N. NIGERIA, Zungeru (*Macfie*), 1 ♀ type. *Exp.* 20 mm.

5951 a. *Eulocastra seminigra*, sp. n.

♀. Head and thorax ochreous; frons and antennæ deep black; fore and mid tibiæ and the fore tarsi blackish; abdomen blackish, the extremity ochreous. Fore wing with the basal half bounded by the oblique slightly sinuous black medial line, the terminal half fuscous black, the termen and cilia ochreous; indistinct waved blackish postmedial and subterminal lines. Hind wing ochreous suffused with pale fuscous, the termen and cilia ochreous.

*Hab.* N. NIGERIA, Minna (*Macfie*), 1 ♀ type. *Exp.* 16 mm.

5970 a. *Acanthofrontia anacantha*, sp. n.

Frons with truncate process at middle of prominence.

♀. Head and thorax white, the prothorax with pair of short black streaks; antennæ black; tibiæ and tarsi banded dark brown and white; abdomen yellow with dorsal blackish bands and lateral series of black spots, the ventral surface white. Fore wing silvery white; the orbicular and reniform defined by curved black striæ at sides; the terminal half of costa with series of short black streaks. Hind wing silvery white, rather thinly scaled. Underside of fore wing and costal area of hind wing tinged with red-brown.

*Hab.* N. NIGERIA, Ilorin (*Macfie*), 1 ♀ type. *Exp.* 32 mm.

6077 a. *Hoplotarache albida*, sp. n.

♂. Head and thorax white; antennæ brownish; fore tibiæ and the tarsi fuscous ringed with white, the mid tibiæ with two pale fuscous bands; abdomen white, dorsally tinged with ochreous. Fore wing silvery white; a diffused ante-medial band formed by yellow scales; orbicular and reniform pale brown, small, round; terminal area cupreous red-brown tinged with violaceous grey except at apex, some olive-yellow on its inner edge and on termen except towards apex; traces of a white subterminal line except towards costa, angled outwards at vein 7 and excurved at middle and to tornus; a fine brown terminal line defined on inner side by white; cilia white. Hind wing white with a slight brownish tinge at apex. Underside of fore wing tinged with brown except the inner area.

*Hab.* N. NIGERIA, Zungeru (*Macfie*), 1 ♂ type. *Exp.* 20 mm.

6138 a. *Tarache dichroa*, sp. n.

♂. Head and thorax bright yellow; antennæ black-brown; palpi white with blackish rings on second and third joints; lower part of frons brown; pectus and legs white, the latter irrorated with brown, the tarsi ringed with white; abdomen reddish brown with ochreous segmental lines, the ventral surface brownish white. Fore wing bright yellow extending on costa to beyond middle and on inner margin to middle, the terminal area black-brown irrorated with blue-grey; the yellow area defined by a black line with some white on its inner side, oblique to vein 6, then incurved. Hind wing ochreous suffused with red-brown especially towards termen; cilia brown at base, white at tips; the underside white tinged with brown, a white patch on costal area before apex.

*Hab.* SUDAN, Port Sudan (*Mrs. Waterfield*), 2 ♂ type. *Exp.* 16 mm.

6153 a. *Tarache vau-album*, sp. n.

♀. Head and thorax white; antennæ fuscous; fore tibiæ and tarsi fuscous ringed with white; abdomen white, dorsally tinged with fuscous except at base. Fore wing with oblique olive-green patch on basal costal area tinged with blue-grey towards base and with excurved blue-grey line towards its outer edge, the patch connected by olive-green suffusion with the dark postmedial area; the basal inner area silvery white; a large silvery-white V-shaped patch from medial part of costa to median nervure, its outer arm oblique, a

blue-grey and olive-green patch on costa between its arms; the terminal area olive-green shading to purplish grey and to red at apex, its inner edge obliquely incurved to middle of inner margin; an indistinct double slightly waved purplish-brown postmedial line, arising below costa, excurved to vein 4, then incurved, some blue-grey before it towards inner margin; a terminal series of purplish lunules defined on inner side by a crenulate white line, the lunule below vein 2 blackish; some red at tornus; cilia white with an olive line near base and purplish lines at middle and tips. Hind wing with the basal half white, the veins, costal area, and terminal half fuscous brown with a purplish tinge; cilia white with a brown line through them towards apex. Underside of fore wing fuscous brown, the base and inner area to beyond middle white; hind wing with some brown irroration and a brownish patch at middle on basal half of costal area.

Ab. 1. Fore wing with the dark basal patch not connected with the postmedial area by olive-green suffusion. Canara.

*Hab.* N. NIGERIA, Minna (*Macfie*), 1 ♀ type; BOMBAY, Canara (*Ward*), 1 ♀. *Exp.* 34 mm.

6192 a. *Tarache sphærophora*, sp. n.

♂. Head and thorax white irrorated with fuscous, the patagia and sides of thorax white mixed with rufous; pectus and legs ochreous white, the fore legs blackish in front, the tarsi black ringed with white; abdomen ochreous white suffused with brown. Fore wing pale ochreous tinged with red-brown, the termen white slightly irrorated with brown except towards tornus; a slight curved brown subbasal line extending to inner margin; antemedial line double, black, oblique and slightly downcurved to submedian fold, the inner line stronger and the outer slightly angled outwards below costa, below submedian fold incurved, and almost obsolete below vein 1; a round whitish patch in and beyond end of cell with a small brown spot in middle, some black on its lower and outer edge; a fine double highly curved postmedial line, the inner line slightly waved except towards costa, followed by another highly curved line which is strong and black to vein 1, then fine and brown, this again is followed by fine double brown highly curved line, making five highly curved lines beyond the discal patch, the middle one strong and black; a fine waved black terminal line. Hind wing white suffused with cupreous brown; cilia white mixed with some brown; the underside white irrorated with

brown, an indistinct diffused curved postmedial line, and terminal series of black striæ.

*Hab.* N. NIGERIA, Zungeru (*Macfie*), 1 ♂ type. *Exp.* 20 mm.

*SARROTHRIPINÆ.*

6494 a. *Characoma stictigrapta*, sp. n.

♀. Head and thorax grey mixed with brown; palpi with the second joint black behind; antennæ blackish; tegulæ blackish towards tips, the patagia with minute black spot at base; fore legs suffused with brown, the tarsi with whitish rings; abdomen whitish tinged with brown. Fore wing grey tinged with red-brown and irrorated with black; a curved subbasal black striga from costa and spot in and below the cell; an obliquely curved antemedial series of four small black spots with a slight spot beyond it in submedian fold; a small black discoidal spot; a postmedial series of nine small black spots, excurved from below costa to vein 4, then incurved, a blackish shade beyond it on costal area; an interrupted maculate black subterminal line, excurved below vein 7 and at middle; a terminal series of minute black spots. Hind wing whitish suffused with reddish brown. Underside of fore wing fuscous brown; hind wing pale brown, the termen darker.

Ab. 1. Fore wing with rounded medial black patch in submedian interspace.

*Hab.* GOLD COAST, Aburi (*Armstrong*), 3 ♀ type; NATAL, Maritzburg (*Berensburg*), 1 ♀. *Exp.* 26 mm.

*Larva.* Feeds in the pods of Kola and Cacao and forms a cocoon of white silk dorsally angled in front.

6568. *Giaura leucopasa*, sp. n.

♂. Head and thorax white irrorated with some brown and black scales; palpi with the second and third joints blackish towards base; abdomen red-brown with the crests white, the extremity grey; the ventral surface white. Fore wing white irrorated with black to middle of costa and inner margin beyond middle, the rest of wing grey-white irrorated with red-brown; a brown and blackish patch on basal part of costa; antemedial line fine, black, sinuous, angled inwards in cell; a spot formed of brown and black scales in middle of cell and a diffused patch of red-brown scales below middle of cell; medial line double, the inner line indistinct and interrupted, the outer black, waved, and somewhat oblique, another oblique, waved, black line from just beyond it on

costa with a small black spot on it at vein 2, a slight dark patch before it on costa, then some rufous on its outer side running obliquely to the postmedial line at vein 2; postmedial line indistinct whitish with a slight dark patch beyond it on costa, bent outwards below costa, then waved and defined on outer side by rufous; a maculate blackish subterminal line, excurved below costa and incurved at discal and submedian folds; a series of small blackish spots just before termen. Hind wing white, the terminal area tinged with brown from apex to vein 2; cilia white.

*Hab.* DUTCH N. GUINEA, Snow Mts., Oetakwa R. (*Meek*), 1 ♂ type. *Exp.* 24 mm.

6605 a. *Selepa albisigna*, sp. n.

♀. Head, thorax, and abdomen ochreous whitish mixed with dark brown; palpi blackish; fore tibiæ and the tarsi blackish ringed with white. Fore wing whitish, the basal half of inner area and the terminal area irrorated with black-brown; an oblique brown subbasal striga from costa; an indistinct, interrupted, obliquely curved, brown antemedial line with an oblique red-brown shade beyond it from costa to median nervure; a black point in middle of cell and two discoidal points; postmedial line brown slightly defined on inner side by white, strongly and obliquely bent outwards below costa, then minutely waved and oblique below vein 4, some short dark streaks beyond it on costa; the terminal area with small triangular white patch below vein 3; a terminal series of black points. Hind wing pale brown; a fine white line at base of cilia. Underside of both wings brown.

*Hab.* GOLD COAST, Bibianaha (*Spurrell*), 1 ♀ type. *Exp.* 18 mm.

Genus DIPLOLOPHA, nov.

Type, *D. cycloptera*.

Proboscis fully developed; palpi upturned, the second joint reaching to vertex of head and broadly scaled, the third moderate, oblique; frons smooth; eyes large, round; antennæ of male ciliated; thorax clothed almost entirely with rough scales, with very large double crest of spatulate scales enclosing a hollow; fore femora with thick fringe of long spatulate scales, the tibiæ moderately fringed with hair; abdomen with some rough hair on basal segments and basal crest. Fore wing with the costa highly arched on basal half, then nearly straight, the apex rectangular, the

termen obliquely curved and slightly crenulate; veins 3 and 5 from near angle of cell; 6 from below upper angle; 9 and 10 strongly anastomosing with 8 to form a long areole; 11 from cell. Hind wing with veins 3, 4 from angle of cell; 5 fully developed from above angle; 6, 7 from upper angle; 8 anastomosing with the cell near the base only. The retinaculum of male curled round the frenulum.

6746 a. *Blenina metascia*, sp. n.

♂. Head and thorax sap-green mixed with some brown; palpi with the second joint black above; lower part of frons whitish; antennæ brown; tegulæ with black medial line; pectus and legs ochreous white, the tibiæ and tarsi with some brown; abdomen red-brown, the crests whitish and brown, the anal tuft whitish at extremity, the ventral surface whitish tinged with red-brown. Fore wing yellow-green mixed with some white and a few blackish scales; some red-brown at base of inner margin, with some blackish above it; a blackish subbasal line from costa to vein 1, incurved in cell; antemedial line very indistinct, green, waved; a double indistinct waved blackish medial line; postmedial line very indistinct, double, blackish, waved, obliquely curved from costa to vein 4; the costal edge beyond it whitish with some dark points; subterminal line blackish, waved, angled inwards below vein 2; the termen whitish with black-brown patches before it below apex and above middle, connected with the termen by short dark streaks on the veins; cilia brownish with series of blackish spots, the tips whitish chequered with blackish towards apex. Hind wing pale rufous, the terminal area red-brown, a red-brown medial shade followed by a pale shade; cilia whitish at tips except towards apex. Underside of fore wing rufous, an oblique medial shade and the terminal area red-brown; hind wing ochreous white, a narrow medial red-brown band from costa to submedian fold and the terminal area red-brown.

*Hab.* BOMBAY, Kanara, Karwar (*T. R. Bell*), 1 ♂ type. *Exp.* 42 mm.

*Cocoon* yellow with some black granules on surface.

6777 a. *Risoba viridescens*, sp. n.

♀. Head, thorax, and abdomen white mixed with brown; palpi, frons, and antennæ brown; tarsi brown with pale



rings. Fore wing brown mixed with grey and some green, the veins darker; a diffused greenish fascia below the costa; the basal inner area obliquely white with some green; sub-basal line blackish, excurved below costa and ending at submedian fold; antemedial line blackish, oblique and waved to submedian fold, then incurved; a rather diffused, oblique, slightly waved, medial line; reniform defined by dark brown and with brown spot in centre, large, rounded; postmedial line blackish, strongly bent outwards below costa, then slightly produced at the veins, incurved below vein 5, a slight dark shade beyond it; subterminal line black defined on outer side by green and by whitish towards costa, strong from below costa to vein 5, minutely waved just below costa, angled outwards above vein 6 and bent outwards at vein 5; an oblique brown shade from apex; a series of black striæ before termen defined on inner side by whitish; a fine waved dark terminal line and pale line at base of cilia. Hind wing creamy white; a brown discoidal lunule; the terminal area suffused with brown with some whitish before termen between vein 6 and submedian fold; a terminal series of brown lunules defined on inner side by whitish; the underside with the costal area irrorated with brown, the discoidal lunule black, a slight waved postmedial line towards costa, then a series of points on the veins, a dark brown subterminal shade and series of lunules on termen from apex to vein 2.

*Hab.* JAVA, Tosari (*Cockayne*), 1 ♀ type. *Exp.* 36 mm.

*ACONTIANÆ.*

6893 a. *Lophocrama hemipyria*, sp. n.

Palpi of male with the tuft of hair at extremity of second joint slight.

♂. Head and thorax bright yellow-green; palpi, frons, and antennæ black mixed with some white; pectus and femora white; fore and mid tibiæ black and white, the fore tarsi rufous ringed with white, the mid tarsi blackish ringed with white, the hind tibiæ and tarsi rufous, the latter ringed with white; abdomen fiery red, the anal tuft blackish, the ventral surface white tinged with rufous. Fore wing bright yellow-green; a small black spot at base of costa; a small black antemedial black spot on costa with traces of an oblique sinuous line arising from it; a small medial black spot on costa; an iron-brown patch on tornal part of termen and cilia, its inner edge slightly angled outwards at submedian fold; cilia brown and grey at tips.

Hind wing fiery red. Underside of fore wing fiery red, the inner area whitish, the cilia brownish; hind wing yellow suffused with red, the terminal area fiery red.

*Hab.* GOLD COAST, Bibianaha (*Spurrell*), 1 ♂ type. *Exp.* 30 mm.

6974 a. *Maceda ignepicta*, sp. n.

♂. Head and thorax brown mixed with grey, the tegulæ and base of patagia with some rufous; pectus white; tarsi brown ringed with white; abdomen grey-brown, the ventral surface white. Fore wing grey-brown; a fiery-red and yellow patch at base of costa crossed by the black-brown subbasal line and with some black-brown on its outer edge; antemedial line dark, strong towards costa, then slight, excurved below costa and cell and, incurved at median nervure and vein 1; a black discoidal point; postmedial line dark, oblique to vein 6, then dentate, bent inwards at vein 3 and angled outwards at vein 1; a reddish patch irrorated with brown on postmedial part of costa, defined below by a dark streak on vein 6 from the postmedial line to termen; an indistinct brown subterminal line, excurved below vein 7, incurved at discal fold, then waved; the termen brown except at apex and tornus, diffused at discal fold; a fine pale line at base of cilia. Hind wing fuscous brown, the interspaces just beyond the cell faintly paler; cilia white at tips except towards apex; the underside white, the terminal area fuscous with sinuous inner edge, a slight black discoidal lunule.

♀. Tegulæ except at tips and base of patagia fiery red; fore wing with the basal patch fiery red, the postmedial patch more rufous.

*Hab.* DUTCH NEW GUINEA, Arfak Mts., Ninay Valley (*Pratt*), 1 ♀; BR. N. GUINEA, Dinawa (*Pratt*), 1 ♂ type. *Exp.*, ♂ 36, ♀ 38 mm.

Genus TROGOXESTIS, nov.

Type, *Eublemma crenularia*, Beth-Baker.

Proboscis fully developed; palpi upturned, the second joint reaching to middle of frons and slenderly scaled, the third moderate; frons smooth; eyes large, round; antennæ of male ciliated; thorax clothed almost entirely with scales and without crests; tibiæ slightly fringed with hair; abdomen without crests. Fore wing with the apex rounded, the termen excised below apex and excurved at middle, the

inner margin lobed before middle and excised towards tornus, with scale-teeth before middle and at tornus; veins 3 and 5 from near angle of cell; 6 from below upper angle; 7 from angle; 8, 9, 10 stalked from before angle; 11 from cell. Hind wing with veins 3, 4 shortly stalked; 5 fully developed from just above angle of cell; 6, 7 from upper angle; 8 anastomosing with the cell near base only.

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XIX. — *On new Mammals, mainly from Bandon and the adjacent Islands, East Coast of the Malay Peninsula.*

By HERBERT C. ROBINSON, C.M.Z.S., and C. BODEN KLOSS, F.Z.S.

THE following new races of mammals were obtained in the course of a collecting-expedition to the N.E. coast of the Malay Peninsula in the Siamese province of Bandon and the neighbouring islands of the Koh Samui and Koh Pennan, lying between latitude 9° N. and 10° N., roughly 300 miles south of Bangkok. Those not actually obtained in these localities have come to light in the course of working out the collections.

*Petaurista nitida cicur*, subsp. n.

*Type*.—Adult male (skin and skull), No. 58/13, Federated Malay States Museum, collected at Ban Kok Klap, Bandon, N.E. Malay Peninsula, 2nd July, 1913, by H. C. Robinson and E. Seimund. Original no. 5614.

*Characters*.—A member of the *Petaurista nitida* \* section, more closely allied to the island forms of the species (*P. n. nitida* from Java, *P. n. rajah* from Borneo, and *P. n. marchio* from Sumatra) than to the South Malayan race (*P. n. melanotus*), from which it differs in its chestnut, not bay, pelage and the marked dark tips to the hairs of the back.

*Colour*.—Above rich chestnut, the head considerably paler, all the hairs of the upper surface, except those of the head, tipped with black; muzzle, a broad orbital ring, entire inner surface and posterior half of outer surface of ears, and a large patch behind them black. Black of hands and feet extending beyond the wrists and ankles. Margin of antebrachial membrane broadly black, this colour extending, to a diminishing extent, halfway up the tail. Distal half of

\* Thomas, Ann. & Mag. Nat. Hist. (8) i. pp. 250-2 (1908).

tail, except a black tip, ochraceous orange, terminal half more chestnut. Under surface of body pale ochraceous orange.

*Skull*.—Closely resembles that of the adjacent form, *P. n. melanotus*, but differs in the longer and broader postorbital processes.

*Measurements*.—Collectors' external measurements (taken in the flesh):—

Head and body 417 (415\*) mm.; tail 486 (445); hind foot 77 (74); ear 41.

Skull: greatest length 70.5 (70.1); condylo-basilar length 62.0 (60.0); interorbital breadth 14.0 (14.8); zygomatic breadth 47.9 (46.2); cranial breadth 31.6; median length of nasals 20.3 (21.0); diastema 15.1 (14.6); upper molar series including  $pm^3$  16.2 (15.1).

*Specimens examined*.—Nine, all from the type-locality.

*Remarks*.—The series is remarkably constant in the characters above noted, and can be separated at a glance from the southern peninsular form by the greater extent of the black areas and by the marked black tips to the hairs of the back.

*Sciurus erythræus youngi*, subsp. n.

*Type*.—Adult male (skin and skull), No. 1823/11, Federated Malay States Museum, collected on Gunong Tahan, 5–6000 ft., Northern Pahang, by H. C. Robinson and C. B. Kloss, July 19th, 1911. Original no. 4428.

*Characters*.—Allied to *Sc. rubeculus*, Miller †, but somewhat smaller and duller in colour, the head and tail lacking the golden-orange suffusion so conspicuous in that race (metatype examined).

*Colours*.—Whole upper surface, chin, throat, chest, and narrow median ventral line from chest to vent grizzled black and buff, giving an olivaceous effect; a smaller proportion of black in the grizzling of the under surface. Hands and feet blackish, only slightly grizzled with buff; upper part of the ears clad with ochraceous hairs; basal portion of tail above like the back, but more coarsely grizzled, rest of the tail distinctly annulated with black and ochreous buff, the hairs with broad orange-buff tips. Under surface rufous chestnut.

\* Measurements in parentheses are those of an adult male *Petaurista nitida melanotus* from Dusun Tua, Selangor, Federated Malay States Museum, No. 1259/08.

† Smithsonian Misc. Coll. 45, p. 22 (1903).

*Skull and teeth*.—Except in their slightly smaller size, the skull and teeth present no differential characters from *Sc. e. rubeculus*.

*Measurements*.—Collectors' external measurements (taken in the flesh) :—

Head and body 201 (210 \*) mm.; tail 195 (208) ; hind foot 48 (50).

Skull: greatest length 51·8 (54·4) ; condylo-basilar length 43·9 (47·1) ; interorbital breadth 19·7 (20·1) ; zygomatic breadth 32·1 (32·2) ; cranial breadth 23·4 (23·7) ; median length of nasals 14·9 (16·1) ; diastema 11·9 (12·2) ; upper molar series, including  $pm^3$ , 9·4 (10·3).

*Specimens examined*.—Sixty-five, including thirty from the type-locality.

*Remarks*.—We have long suspected that specimens of this type of squirrel from the mountain ranges of the southern two-thirds of the Malay Peninsula were not strictly conspecific with *Sc. rubeculus* from Trang. The receipt of a series of eight from the mountains of Bandon shows that the southern form is sufficiently distinct to merit separation, and we have accordingly named it after Sir Arthur Young, K.C.M.G., Governor of the Straits Settlements and High Commissioner, Malay States, who has recently ascended Gunong Tahan. Examination of the type of *Sc. griseopectus*, Blyth †, with which Bonhote has associated it, shows that the present animal cannot be assigned to that form.

*Sciurus concolor fallax*, subsp. n.

*Type*.—Adult male (skin and skull), No. 134/13, Federated Malay States Museum, collected on Koh Pennan, N.E. Malay Peninsula, 30th May, 1913, by H. C. Robinson and E. Seimund. Original no. 5504.

*Characters*.—A race of *Sciurus concolor* (with which is included *Sc. epomophorus*) most closely allied to *Sc. c. milleri* ‡ from Trang, but somewhat duller above ; head, limbs, and under surface darker and clearer grey in tone.

*Colour*.—Upper surface grizzled black and buff, except on the fore limbs, head, and hind feet, where the grizzle becomes black and white, producing a grey effect ; shoulder-patches and flanks suffused with pale ochraceous, the colour of the

\* Measurements in parentheses are those of an adult male *Sciurus erythræus rubeculus* from Kao Nawng, 3500 ft., Bandon, N.E. Malay Peninsula ; Federated Malay States Museum, No. 69/13.

† Journ. Asiat. Soc. Bengal, xvi. p. 873 (1847).

‡ Robinson & Wroughton, Journ. Fed. Malay States Mus. iv. p. 233 (1911).

flanks spreading on to the abdomen; rest of the under surface grizzled silvery-grey, a darker obsolescent median stripe down the abdomen more yellowish. Tail coarsely annulated with black and buffy-white, the colour of the back extending some distance down the basal portion above and below, pencil pure black.

*Skull and teeth*.—Present no differential characters from those of *Sc. c. milleri*, except the slightly larger size.

*Measurements*.—Collectors' external measurements of type (taken in the flesh):—

Head and body 226 (229\*); tail 237 (214); hind foot 49.5 (48.0).

Cranial measurements: greatest length 55.5 (54.3); condylo-basilar length 47.9 (45.3); interorbital breadth 21.2 (18.9); zygomatic breadth 33.2 (31.7); cranial breadth 24.4 (24.3); median length of nasals 16.8 (15.8); diastema 12.4 (11.3); upper molar series, including  $pm^3$ , 11.1 (11.0).

*Specimens examined*.—Thirty-five, all from the type-locality.

*Remarks*.—Somewhat closely allied to the adjacent mainland form, but very constant in its characters.

*Sciurus concolor samuiensis*, subsp. n.

*Type*.—Adult male (skin and skull), No. 201/13, Federated Malay States Museum, collected on Koh Samui, N.E. Malay Peninsula, 13th May, 1913, by H. C. Robinson and E. Seimund. Original no. 5341.

*Characters*.—Allied to *Sc. c. epomophorus* † from Salanga, and differing from the preceding race (*Sc. c. fallax*) in the much more strongly marked shoulder- and flank-patches and in the rufous-hazel colouring of the base of the under surface of the tail.

*Colour*.—Upper surface much as in *Sc. c. fallax*, but sides of neck, flanks and lower portion of abdomen, back of thighs, and base of tail beneath rufous-hazel. Outer surface of thighs and nuchal region slightly suffused with the same colour. Underparts much as in other forms of the species. Tail with clear black pencil.

*Skull and teeth*.—Do not differ from those of *Sc. c. fallax*.

*Measurements*.—Collectors' external measurements (taken in the flesh):—

Head and body 234 mm.; tail 242; hind foot, 49.

\* Measurements in parentheses are those of an adult male *Sc. c. milleri* from Chong, Trang, Western Siamese Malay States; Federated Malay States Museum, No. 11/10.

† Bonhote, Ann. & Mag. Nat. Hist. (7) vii. p. 272 (1901).

Cranial measurements : greatest length 56.1 ; condylo-basilar length 48.2 ; interorbital breadth 19.9 ; zygomatic breadth 32.8 ; cranial breadth 25.2 ; median length of nasals 18.1 ; diastema 12.6 ; upper molar series, including  $pm^3$ , 11.1.

*Specimens examined*.—Forty, all from the type-locality.

*Remarks*.—Amongst the series obtained are a large proportion which differ from the specimen described above in having the rufous hazel of the shoulders and flanks invading the dorsal area and coalescing on the nape. It is possible that this indicates that the form possesses two seasonal pelages, as is apparently the case in *Sc. caniceps*, but is almost certainly not so in *Sc. concolor* and allied races. Since the whole series before us was obtained within a period of one month it is at present impossible to make any definite pronouncement on the point.

*Ratufa melanopepla decolorata*, subsp. n.

*Type*.—Adult female (skin and skull), No. 251/13. Federated Malay States Museum, collected on Koh Samui, N.E. Malay Peninsula, 15th May, 1913, by H. C. Robinson and E. Seimund. Original no. 5356.

*Characters*.—Nearer in colour to *R. m. melanopepla* from the mainland than to the other island races, but very much smaller. Skull more slenderly built.

*Colour*.—Apparently as in *R. melanopepla melanopepla*.

*Skull and teeth*.—Interpterygoid space relatively wider than in the typical form and zygomatic much lighter.

*Measurements*.—Collectors' external measurements (taken in the flesh) :—

Head and body 328 (342 \*); tail 417 (455); hind foot 68 (75).

Cranial measurements : greatest length 68.7 (72.8); condylo-basilar length 57.1 (61.2); interorbital breadth 26.2 (29.3); zygomatic breadth 42.6 (45.8); greatest length of nasals 23.0 (24.8); diastema 14.1 (16.0); upper molar series 13.4 (14.1).

*Specimens examined*.—Thirteen, twelve from the type-locality and one from Koh Penman.

*Remarks*.—With one exception all the specimens are in highly bleached pelage, though some are assuming the new coat on the anterior half of the body. It is therefore difficult to state whether any colour-differences exist between this form and that of the mainland.

\* Measurements in parentheses are those of an adult female from Kao Nawng, 1100 ft., on the adjacent mainland; Federated Malay States Museum, No. 250/13.

*Epimys orbus*, sp. n.

*Type*.—Adult male (skin and skull), No. 61/13, Federated Malay States Museum, collected on Kao Nawng, 3500 ft., Bandon, N.E. Malay Peninsula, 23rd June, 1913, by H. C. Robinson and E. Seimund. Original no. 5641.

*Characters*.—A rat with very spiny pelage and small flattened bullæ. Tail very greatly exceeding head and body in length. Lower pelage sharply defined from upper. Tail bicolor, but not markedly so, very slightly penicillate at tip.

*Colour*.—Pelage above, as in other rats of the group, composed of three elements: (a) long black piles, best developed on the lower back, (b) flattened spines with black tips, and (c) soft fur, grey at the base, rich ochraceous on the terminal half of the hairs, producing a grizzled ochraceous effect darkest on the median line of the back; cheeks and sides of the head and neck almost pure ochraceous. Under surface white with a creamy tinge, the white extending to the wrists but not to the ankles. Upper surface of hands and feet dirty white with a dark clay-brown median streak, not reaching the base of the digits. Tail bicolor, with fine annulations, clad with fine silky hairs longer at the tip.

*Skull and teeth*.—The skull is not markedly different from those of *E. jerdoni bukit* and *E. cremoriventer*, but rather larger, the palatal foramina broader, as also the infraorbital plate, and the zygomatic arches less flaring, so that the skull appears relatively narrower.

*Measurements*.—Collectors' external measurements (taken in the flesh):—

Head and body 153 (141 \*) mm.; tail 235 (188); hind foot 32 (26); ear 20 (18.5).

Cranial measurements: greatest length 38.1 (36.4); basal length 30.1 (29.2); palatal length 16.8 (15.8); length of nasals 13.9 (13.0); greatest breadth of combined nasals 5.2 (4.6); shortest distance between tips of nasals and lachrymal notch 14.5 (13.1); diastema 9.8 (9.1); upper molar row 6.3 (6.3); length of palatal foramina 6.3 (6.2); breadth of combined foramina 3.3 (2.7); zygomatic breadth 17.0 (17.4); cranial breadth 15.9 (14.7).

*Specimens examined*.—Five, all from the type-locality.

*Remarks*.—The only rat with which this species requires comparison is *Mus cinnamomeus*, Blyth †, of which the only

\* Measurements in parentheses are those of an adult male *E. cremoriventer* from Gunong Ijau, 4700 ft., Larut, Perak; Federated Malay States Museum, No. 1809/11.

† Journ. Asiat. Soc. Bengal, xxviii. p. 294 (1859).



specimens known are the types from the valley of the Sittang, Lower Pegu, over 500 miles distant. Amongst local forms it is readily distinguished from *E. cremoriventer* by its greater size and bicolor tail, not strongly penicillate at the tip, and from *E. jerdoni bukit* by longer less markedly bicolor tail, and by its richer colouring. It agrees with both and differs from all the other local forms in the greenish-grey bases of the dorsal spines.

*Epinys jerdoni pan*, subsp. n.

*Type*.—Adult male (skin and skull), No. 80/13, Federated Malay States Museum, collected on the hills of Koh Samui, N.E. Malay Peninsula, 15th May, 1913, by H. C. Robinson and E. Seimund. Original no. 5351.

*Characters*.—A spiny rat of the *jerdoni* group, with bicolor tail, considerably exceeding head and body in length, but relatively shorter than that of the mainland form.

*Colour*.—Above mingled ochreous buff and dark brown, the former predominating on the sides of the head and neck, below pure buffy white, sharply defined from the sides; hands and feet whitish, the median areas brownish. Bases of the spines greenish grey.

*Skull and teeth*.—Not differing materially from those of *E. j. bukit*\*, but with the anterior margin of the mesopterygoid space more abruptly truncate, less rounded; rostrum somewhat heavier, and nasals longer.

*Measurements*.—Collectors' external measurements (taken in the flesh):—

Head and body 149 (158†) mm.; tail 174 (192); hind foot 27.5 (30.0).

Cranial measurements: greatest length 37.7 (37.0); condylo-basilar length 31.5 (31.0); palatilar length 16.0 (15.0); length of nasals 14.7 (13.0); greatest breadth of combined nasals 4.4 (4.6); shortest distance between tips of nasals and lachrymal notch 14.2 (13.8); diastema 10.0 (9.4); upper molar row 5.6 (5.9); length of palatal foramina 6.4 (6.3); breadth of combined foramina 2.9 (2.7); zygomatic breadth 17.0 (16.9); cranial breadth 14.6 (15.0).

*Specimens examined*.—Five, all from the type-locality.

*Remarks*.—This form is somewhat closely allied to the mainland *E. jerdoni bukit*, but the differences, which seem constant, are sufficient to separate it as an insular race.

\* Bonhote, Ann. & Mag. Nat. Hist. (7) xi. p. 125 (1903).

† Measurements in parentheses are those of an adult male *E. jerdoni bukit* from Chong, Trang, Western Siamese Malay States; Federated Malay States Museum, No. 30/10.

*Epimys surifer manicalis*, subsp. n.

*Type*.—Adult male (skin and skull), No. 351/13, Federated Malay States Museum, collected on Koh Pennan, N.E. Malay Peninsula, 27th May, 1913, by H. C. Robinson and E. Seimund. Original no. 5462.

*Characters*.—Distinguished from all the other local races by having the white area of the under surface extending over the upper surface of the forearms. Tail shorter than head and body.

*Colour*.—Upper surface ochraceous, darkened on the back and rump by the bistre tips to the spines. Below pale creamy white, this colour extending over the upper anterior half of the forearms. No tawny neck-collar; hands and feet white; tail bicolor.

*Skull and teeth*.—As in *E. surifer surifer*, the muzzle not heavier or the tooth-row reduced as in some of the island races.

*Measurements*.—Collectors' external measurements (taken in the flesh):—

Head and body 176; tail 173; hind foot 38; ear 23·5.

Cranial measurements: greatest length 43·4 (46·0\*) mm.; basal length 36·9 (40·0); length of nasals 17·6 (18·6); greatest breadth of nasals 4·5 (5·0); shortest distance between tips of nasals and lachrymal notch 18·0 (—); palatal length 18·6 (19·0); diastema 11·9 (13·4); length of palatal foramina 6·3 (7·4); breadth of combined palatal foramina 3·5 (3·0); zygomatic breadth 19·1 (19·8); cranial breadth 15·1 (16·0); upper molar row 6·7 (7·0).

*Specimens examined*.—Twenty, all from the type-locality.

*Remarks*.—A medium-sized race of *E. surifer* with narrow nasals and with the white on the upper surface of the forearms more extensive than in any other form.

*Epimys surifer spurcus*, subsp. n.

*Type*.—Adult male (skin and skull), No. 288/13, Federated Malay States Museum, collected on Koh Samui, N.E. Malay Peninsula, 14th May, 1913, by H. C. Robinson and E. Seimund. Original no. 5352.

*Characters*.—Like *E. s. flavidulus* from Langkawi, but with the tail relatively and absolutely longer.

*Colour*.—Resembles that of the preceding race, but the white on the forearm reduced to a mere band.

\* Measurements in parentheses are those of an adult male *Mus surifer surifer* (type) from Trang, Siamese Malay States; United States National Museum, No. 86,746.

*Skull and teeth.*—As in *E. s. manicalis*.

*Measurements.*—Collectors' external measurements (taken in the flesh):—

Head and body 163 (197 \*) mm.; tail 165 (158); hind foot 35 5 (36).

Cranial measurements: greatest length 43.3 (44.0); basal length 36 1 (37.0); length of nasals 17.0 (17.0); greatest breadth of nasals 4 7 (5.0); shortest distance between nasals and lachrymal notch 17.7; palatal length 18.6 (18.0); diastema 12.1 (12.6); length of palatal foramina 6 2 (6.4); breadth of combined palatal foramina 3 4 (3.6); zygomatic breadth 18.1 (20.0); cranial breadth 16.1 (17.0); upper molar row 6 1 (6.8).

*Specimens examined.*—Twenty-three, all from the type-locality.

*Remarks.*—Extremely closely allied to *E. s. flavidulus*, from which it is distinguished by the different proportions of the body and tail.

*Epimys remotus*, sp. n.

*Type.*—Adult male (skin and skull), No. 75/13, Federated Malay States, collected in the hills of Koh Samui, N.E. Malay Peninsula, May 17th, 1913, by H. C. Robinson and E. Seimund. Original no. 5366.

*Characters.*—A large rat with unicolor tail, spines in pelage very thin and flexible, piles very numerous and attaining the length of 70 mm. Underparts whitish, sharply demarcated from the flanks. Skull strongly ridged with moderately-sized bullæ, intermediate between those of the *validus* and *rattus* groups. Palatal foramina long and narrow, extending posteriorly beyond the roots of the anterior molar.

*Colour.*—Above mingled ochraceous and sooty brown, darkest on the back, where the long black piles are most numerous; sides of the body and flanks more earthy. Under surface creamy white, sharply defined from the sides. Feet clad with silky whitish hairs, darker down the centre; hands dirty white. Tail brownish black. Vibrissæ long and black.

*Skull and teeth.*—The skull, on the whole, is nearest to that of *validus*, from which it is at once distinguished by the narrow elongate palatal foramina, by the larger bullæ, by the outline of the occipital which is roughly semicircular and not pentagonal, with the parieto-occipital suture almost

\* Measurements in parentheses are those of the type of *E. s. flavidulus* from Langkawi; U.S. National Museum, No. 104,330.

straight, not arched. From those of the *rattus* group it is separated by larger size and less dilated bullæ, which most resemble those of *E. fæderis*, and, therefore, are far smaller than those of *E. bullatus*. The teeth are decidedly larger than those of the *rattus* group.

*Measurements*.—Collectors' external measurements (taken in the flesh) :—

Head and body 225 (222 \*) mm.; tail 273 (251); hind foot 39 (41); ear 26 (23).

Cranial measurements : greatest length 49.1 (52.0); basal length 41.5 (45.0); length of palatal foramina 9.4 (8.25); breadth of combined palatal foramina 3.5 (3.25); length of nasals 18.9 (20.0); interorbital breadth 6.4 (7.0); zygomatic breadth 22.0 (24.0); cranial breadth 17.7 (18.0); diastema 13.3 (15.0); length of upper molar row 8.2 (9.0).

*Remarks*.—This rat is obviously quite distinct from any of the Malayan rats, though it may possibly be allied to *Mus bowersi*, of which we have only been able to examine figures of the skull. The external characters are, however, very different from the plate given by Anderson †.

*Crocidura negligens*, sp. n.

*Type*.—Adult male (skin and skull), No. 275/13, Federated Malay States Museum, collected on Koh Samui, N.E. Malay Peninsula, 12th May, 1913, by H. C. Robinson and E. Seimund. Original no. 5338.

*Characters*.—A very pale member of the genus, about the same size as *C. malayana* ‡, smaller than *C. klossii* §, and *C. aoris* §.

*Colour*.—Above and below uniform pale "Payne's grey" with no tinge of brown. Tail with a few scattered whitish hairs. Adpressed hairs of lateral scent-gland somewhat paler in colour than the rest of the pelage.

*Skull and teeth*.—Skull much damaged, but apparently not differing from those of the other local races. Smaller than that of *C. malayana*.

*Measurements*.—Collectors' external measurements (taken in the flesh) :—

Head and body 92 mm.; tail 62; hind foot 14.7; ear 10.

\* Measurements in parentheses are those of an adult male specimen of *E. bullatus* (Lyon), type of *E. villosus* (Kloss), from Singapore Island; Selangor Museum, No. 1348/08.

† Anderson, Anat. & Zool. Res. p. 304, pl. xvii. (1878).

‡ Journ. Fed. Malay States Mus. iv. p. 243 (1911).

§ Ann. & Mag. Nat. Hist. (8) x. p. 589 (1912).

Cranial measurements: palatal length 9.4 (9.9 \*); lachrymal breadth of rostrum 4.2 (4.4); greatest breadth above molars 7.0 (7.3); maxillary tooth-row, including incisors, 10.1 (10.1); mandibular tooth-row, including incisors, 9.0 (9.3).

*Specimens examined*.—One, the type.

*Remarks*.—The pale coloration sufficiently separates this form from the other local races, while the maxillary tooth-row is relatively longer than in *C. malayana*, which it approaches in size.

*Tupaia ferruginea operosa*, subsp. n.

*Type*.—Adult female (skin and skull), No. 93/13, Federated Malay States Museum, collected on Koh Samui, N.E. Malay Peninsula, 12th May, 1913, by H. C. Robinson and E. Seimund. Original no. 5335.

*Characters*.—A small dull-coloured species resembling *T. f. wilkinsoni* † from the adjacent mainland, but smaller, in that respect closest to *T. f. obscura* ‡ from the Redang Islands, but with a shorter rostrum.

*Colour*.—Entire upper parts a speckle of ochraceous buff and black, brightest on the rump and thighs. Shoulder-stripe very slightly marked. Under surface rich buff. Tail like back above and below, but more coarsely annulated, lacking any pale median area on the lower surface.

*Skull*.—As in *T. f. belangeri* and *T. f. obscura*, but with a slightly shorter rostrum.

*Measurements*.—Collectors' external measurements (taken in the flesh):—

Head and body 163 (180 §) mm.; tail 155 (175); hind foot 40 (42); ear 17.

Cranial measurements: greatest length 47.2 (51.8); basal length 40.5 (44.9); palatal length 24.4 (28.0); palatal breadth at anterior molar 8.1 (9.5); zygomatic breadth 23.8 (25.9); least interorbital breadth 12.9 (14.5); cranial breadth 18.9 (20.9); breadth of rostrum at diastema 6.5

\* Measurements in parentheses are those of the type of *Crocidura malayana* from Maxwell's Hill, Larut, Perak, 3300 ft.; Federated Malay States Museum, No. 1801/11.

† Robinson & Kloss, Journ. Fed. Malay States, iv. p. 173 (1911).

‡ Kloss, Ann. & Mag. Nat. Hist. (8) vii. p. 116 (1911).

§ Measurements in parentheses are those of the type of *T. f. wilkinsoni* from Ko Khau, Trang, Siamese Malay States; Federated Malay States Museum, No. 1138/10. British Museum no. 12. 10. 7. 1.

(7·2) ; lachrymal notch to tip of premaxillaries 18·8 (22·9) ; upper molar series 14·4 (15·9).

*Specimens examined*.—Twenty, all from the type-locality.

*Remarks*.—This race is a depauperated form of the adjacent mainland subspecies *T. f. wilkinsoni*, from which, apart from its smaller size, it may readily be distinguished by having the entire tail concolorous with the back, not blackish above.

*Tupaia ferruginea ultima*, subsp. n.

*Type*.—Adult female (skin and skull), No. 95/13, Federated Malay States Museum, collected on Koh Pennan, N.E. Malay Peninsula, 26th May, 1913, by H. C. Robinson and E. Seimund. Original no. 5450.

*Characters*.—In size and cranial characters similar to *T. f. operosa*, but pelage duller and paler throughout.

*Colour*.—Upper surface grizzled black and buff, darkest on the median line of back and rump, where the black hairs are numerous and conspicuous. Shoulder-stripes more marked than in the preceding race. Tail above and below similar to the flanks. Under surface buff.

*Skull*.—Resembles *T. f. operosa* and *T. f. belangeri*, but with an even shorter rostrum.

*Measurements*.—Collectors' external measurements (taken in the flesh) :—

Head and body 166 (173 \*) mm. ; tail 162 (167) ; hind foot 38·5 (40·0) ; ear 16·5.

Cranial measurements : greatest length 45·5 (48·0) ; basal length 38·8 (42·0) ; palatal length 23·0 (25·8) ; palatal breadth at anterior molar — (8·2) ; zygomatic breadth 23·1 (25·8) ; least interorbital breadth 13·3 (14·0) ; cranial breadth 18·8 (19·1) ; breadth of rostrum at diastema 6·1 (7·0) ; lachrymal notch to tip of premaxillaries 17·6 (20·6) ; upper molar series 14·2 (14·6).

*Specimens examined* —Twenty, all from the type-locality.

*Remarks*.—This form is the smallest and shortest-muzzled of all the Malayan races of *T. ferruginea*, and entirely lacks any reddish wash on the upper surface.

\* Measurements in parentheses are those of the type of *T. f. obscura* from Great Redang Island off the coast of Trengganu ; Federated Malay States Museum, No. 2279/10. British Museum no. 12. 10. 7. 3.

## XX.—On new Species of Histeridæ and Notices of others.

By G. LEWIS, F.L.S.

[Plate IX.]

THIS is the forty-first paper of this series, and it is chiefly concerned in giving a Plate illustrating some interesting species.

The measurements given by authors in this and other families, when only single specimens are available, are sometimes misleading—*e. g.*, I have now an example of *Platylister procerus* which measures  $11\frac{1}{2}$  mm., and another of *Macrolister robusticollis* which measures  $12\frac{1}{2}$  mm., and a specimen of *Probolosternus africanus* of 9 mm. The original records were  $8\frac{1}{2}$ –9, 9, and 7 mm. respectively. The size given of a species in the Histeridæ is only of an approximate value, but it is essential that an accurate standard should be maintained in using words such as *ovalis*, *oblongo-ovalis*, *subovalis*, *breviter-ovalis*, and other terms employed by describers in indicating the outline of a species.

*List of Species, arranged generically.*

|                                   |                                    |
|-----------------------------------|------------------------------------|
| Hololepta salva.                  | Platysoma mimicum.                 |
| — comis.                          | Hister inflexus.                   |
| — optiva.                         | Althanus teretrioides, <i>Lew.</i> |
| — higonæ, <i>Lew.</i>             | Pachylomalus falcatus.             |
| Teretrius antelatus.              | Epitoxus subruber.                 |
| Coptosternus, gen. nov.           | — ascinus.                         |
| — tarsalis.                       | Heterius carinistrius, <i>Lew.</i> |
| Platylister procerus, <i>Lew.</i> |                                    |

*Hololepta salva*, sp. n.

Oblonga, depressa, nigra, nitida; fronte leviter impressa, haud striata; pronoto stria marginali tenui; elytris striis, subhumerali utrinque abbreviata, 1–2 dorsalibus sat longis, 1 appendice recto; propygidio punctis sparsis cincto apice biimpresso; tibiis anticis 4-dentatis.

L.  $10\frac{1}{2}$  mill. (absque mandibulis).

Oblong, depressed, black, and shining; the head very minutely, not closely punctulate, forehead slightly impressed; the thorax, marginal stria fine, except near the anterior angle; the fossette is nearly circular and close to the angle (more so than in *lucida*, *Lec.*), along the sides are a very few small and somewhat obscure scattered punctures; the elytra, sub-

humeral stria is wide in the middle and well shortened at both ends, first dorsal basal and well marked, with a rather long and straight appendage, with a puncture within its apical end, representing, perhaps, an appendage to the second stria, second stria also basal and half the length of the first; the propygidium is bi-impressed posteriorly, and in the impressions the punctures are somewhat close, on either side there are a few ocellate punctures, along the base and on the disc the punctures are very small and few; the pygidium is coarsely and densely punctate; the mentum is rather wide and the carina obscure, being seen only in certain lights; the prosternum is triangularly widened at the base and the anterior lobe is laterally striate; the anterior tibiæ are 4-dentate.

This species differs from all the known Asian species by the position of the thoracic fossettes; those of *H. dyak* are very similar, but the thoracic angle is emarginate and the fossette is behind the emargination.

*Hab.* Sikkim and Trichinopoly, India.

*Hololepta comis*, sp. n.

Oblongo ovalis, depressa, nigra, nitida; fronte bistriata; pronoto lateribus modice punctato; elytris stria 1 dorsali in medio evanescenti vel subinterrupta; propygidio bifoveolato, circum grosse et minute punctato; pygidio dense punctato.

L.  $7\frac{1}{2}$  mill. (absque mandibulis).

Oblong-oval, depressed, black, and shining; the head bi-striate, with a very fine punctuation above; the thorax, lateral stria ceases after passing the anterior angle, within the stria in the median area there is a small cluster of punctures which are continued anteriorly in fewer and finer points; the elytra, subhumeral stria reaches the base, is very broad in the middle and a little shortened before the apex, first dorsal fine and broken or evanescent before the middle, second short, basal, with a very small appendage at the apex; the propygidium has two shallow foveæ punctate, the disc is smooth and surrounded with scattered punctures of various sizes, a few near the middle being the largest; the pygidium is densely punctate; the prosternum, keel narrow but triangularly wide at the base; the anterior tibiæ are 4-dentate, the two at the apex are robust and close together, the intermediate are 3-dentate, with the apical tooth bifid.

*Hab.* Congo River. One female example.



*Hololepta optiva*, sp. n.

Oblonga, depressa, nigra, nitida; fronte bistriata, minutissime punctulata; pronoto lateribus punctato; elytris stria 1 integris, 2 brevi appendice parvo aucta, 3 basali; propygidio antice lateribusque grosse, in medio tenuissime punctulato; pygidio dense punctato; prosterno angusto basi triangulatim dilatato.

L.  $6\frac{1}{2}$  mill. (absque mandibulis).

Oblong, depressed, black, and shining; the head bistriate, surface very finely punctulate; the thorax, lateral stria rather fine, hamate behind the angle, with a narrow lateral band of punctures, some elongate or confluent in the median area and anteriorly behind the angle spread out somewhat; the elytra, subhumeral stria slightly abbreviated posteriorly, the first dorsal fine but distinctly complete, second short, also fine, and about one-fifth of the elytral length, with a very short apical appendage, third basal and scarcely visible; the propygidium bifoveolate and encircled with rather large punctures, some at the sides obscurely ocellate, the punctures inwardly diminish in size until those on the disc are few and very fine; the pygidium is densely punctate, some points being confluent; the prosternum, keel narrow, with a widened triangular base; the anterior tibiæ are 4-dentate, the apical teeth are obtuse and close together.

This is a very distinct species, but the male is unknown.

*Hab.* Ogoone, French Congo. One female example.

*Hololepta higonæ*, Lew., 1894.

I have an example of this species from Laos, Tonking. I found it originally in South Japan, and took it in considerable numbers.

*Teretrius antelatus*, sp. n.

Cylindricus, subelongatus, niger, nitidus, undique punctulatus; pronoto ad angulos obscure rufo; prosterno punctato, striis fere parallelis, antice forte marginato; mesosterno metasternoque sparse punctatis; pygidio haud transverso; tibiis anticis 7-8 denticulatis.

L.  $3\frac{1}{2}$  mill.

Cylindrical, somewhat elongate, black, and shining; the head convex and finely punctulate; the thorax (and upper surface generally) more clearly and evenly punctulate, anterior angles obscurely reddish, marginal stria well marked at the sides and very fine behind the head; the pygidium is

longer and less transverse than that of *punctulatus*, Fährs., and others; the prosternum, the anterior lobe is markedly marginate, the lateral striæ are almost parallel, very slightly diverging anteriorly, keel and lobe rather coarsely, not closely punctate, with a line of punctures along the striæ; the mesosternum is also markedly marginate, and the surface and that of the metasternum sparingly punctulate; the anterior tibiæ are 7-8-denticulate.

This species is narrower (less robust) than *punctulatus*, Fährs., and the other chief distinguishing characters are the more strongly bordered anterior margin of the prosternum, and its striæ are more parallel, scarcely diverging anteriorly, and the punctures of the meso- and metasterna are larger.

*Hab.* Congo State.

#### COPTOSTERNUS, gen. nov.

This genus is founded to receive a single species from Madagascar which superficially somewhat resembles *Macrosternus*, but the body is less depressed, and the other characters which will not permit its inclusion in it are: the pygidium is convex, the prosternal keel is wide and truncate at both ends, the mesosternum is very broad and nearly straight (not sinuous) anteriorly, the anterior tibiæ are outwardly denticulate, tarsal groove not sinuous, and the tarsi are pilose beneath. The form of the forehead (without striæ) and the form of the thorax are very similar to those of *Macrosternus*; the dorsal sutural stria is bent like that of the American *Hister curvatus*, Er., but this being a character of many African species of *Hister*, it cannot be considered an important one.

#### *Coptosternus tarsalis*, sp. n.

Ovatus, depressus, niger, nitidus; fronte leviter impressa haud striata; pronoto lateribus punctulato, stria marginali integra; elytris stria 1-3 integris, 4-5 brevissimis, suturali subintegra arcuata; pygidio paulum convexo; tibiis anticis denticulato, tarsis hirsutis.

L. 6 mill.

Oval, depressed, black, and shining; the head slightly impressed anteriorly, not striate, surface sparsely punctulate; the thorax, marginal stria fine and complete, sides punctured like the head; the elytra without a subhumeral stria, dorsal striæ 1-3 complete, 4-5 very short and apical and nearly meet posteriorly, sutural bowed and slightly abbreviated at the base; the propygidium and pygidium are somewhat

closely but not coarsely punctured, the latter is slightly convex; the prosternum, keel is broad and flat and truncate at both ends, the lateral striæ are very fine and feebly sinuous before the coxæ, within the striæ and parallel to them is a very shallow channel, more conspicuous than the striæ and shortened a little at the base; the mesosternum is transverse and narrow, but relatively as broad as in *Macrosternus lafertei*, anteriorly it is almost straight, not sinuous, across the middle there is a bowed stria, somewhat fine, and it does not reach the outer edges; the anterior tibiæ are 10-11-denticulate and all the tarsi are distinctly hirsute.

*Hab.* Fianrantsoa, Madagascar.

*Platylister procerus*, Lew.

I have specimens of this species which measure  $11\frac{1}{2}$  mm., as stated in the preamble; the mesosternal marginal stria is traceable in the type behind the emargination, but it is not so seen in other examples. The localities of the species are Kumaon, Sikkim, and Yunnan, and it has been found in the burrows of a longicorn in willows.

*Platysoma mimicum*, sp. n.

Oblongo-ovatum, convexiusculum, nigrum, nitidum; fronte stria late arcuata; pronoto stria integra, margine laterali parallela; elytris striis 1-3 integris, 4 parum abbreviata, 5 et suturali dimidiatis; pygidio transverso punctato apice lævi; prosterno angustato; mesosterno emarginato, stria integra.

L.  $2\frac{3}{4}$  mm.

Oblong-oval, little convex, black, and shining; the head microscopically punctulate, stria complete, widely bowed from side to side; the thorax, lateral stria complete and rather close to the margin, strongest behind the head, with a small antescutellar puncture; the elytra, striæ 1-3 complete, 4 little shortened at the base, with a basal puncture, 5 and sutural dimidiate; the propygidium is rather coarsely and somewhat unevenly punctate, with a narrow posterior margin smooth; the pygidium has similar punctures transversely placed close to the base, leaving the apex widely smooth; the mesosternum strongly marginate, stria following the contour of the emargination and continuing laterally to the base of the metasternum, surface of the sterna microscopically punctulate; the anterior tibiæ are 5-denticulate.

The sculpture of the pygidia and the form of the thoracic stria resemble *P. pygidiale*, Lew., but this species has an oval outline.

*Hab.* Chambaganor, Madura, India.

*Hister inflexus*, sp. n.

Ovalis, convexus, niger, nitidus; fronte biimpressa punctulata; pronoto striis lateralibus integris; elytris striis 1-3 integris, suturali ante medium abbreviata; propygidio pygidioque sat dense et grosse punctatis; mesosterno sinuato conspicue marginatoque; tibiis anticis 5-dentatis.

L.  $5\frac{1}{4}$  mill.

Oval, convex, black, and shining; the head, stria nearly straight anteriorly, surface and also the mandibles rather closely punctulate, behind the stria are two feeble impressions; the thorax is very feebly punctulate, with two lateral striæ, the external anteriorly passes the angle, internal is crenulate behind the head and not interrupted; the elytra, striæ, there is no subhumeral, 1-3 dorsal are complete, the first turns towards the second at the base, and the interstice between the second and third widens out anteriorly; the pygidia are somewhat closely punctate, and some of the punctures are ocellate, especially on the outer parts; the mesosternum is sinuous and markedly marginate, the marginal stria laterally does not quite reach the metasternal suture; the anterior tibiæ are 5-dentate, the two apical teeth are close together and have a common base.

This is only the fourth species of *Hister* recorded from Madagascar; *Hister goudoti* and *aquistrius*, Mars., are now assigned to *Atholus*.

*Hab.* Madagascar.

*Althanus teretricides*, Lew. (Pl. IX. fig. 3.)

The tibiæ of this species are similar to many *Trypanæi*, but Mr. Arrow informs me that some of the Lamellicornes, such as *Parastasia* and its allies, also have similar tibiæ; so this structure need not disturb my systematic arrangement of the Histeridæ in placing it in the section with emarginate or sinuous mesosterna.

*Pachylomalus falcatus*, sp. n.

Ellipticus, convexus, niger, nitidus; *P. musculo* forma simillimis, at differt mesosterno utrinque arcuatim striato.

L.  $2\frac{1}{2}$  mill.

Elliptical, convex, black, and shining, with the legs ferruginous, upper surface very finely punctulate, the marginal stria of the head fine and complete, thoracic antescutellar striæ oblique, the prosternal striæ are not inturned at the

base, the mesosternum has an arcuate stria on each side of the emargination, the transverse stria is moderately bowed.

In this genus *P. leo*, *tuberosus*, and *falcatus* have lateral mesosternal striæ, but they are not marginal. *P. mus*, *musculus*, *andrewesi*, and *victor* have only the transverse stria.

*Hab.* Montalvan, near Manila (*E. Simon*). Two female examples.

*Epitoxus subruber*, sp. n.

Suborbicularis, convexus, nitidus; fronte puncticulata stria antice late interrupta; pronoto lateribus punctato; elytris obscure rufis, striis 1-4 et suturali integris, 2 posterioribus basi arcuatim junctis, 5 in medio abbreviata; pygidio vix dense punctulato; tibiis 8-9-denticulatis.

L.  $2\frac{3}{4}$ -3 mill.

Somewhat orbicular in outline, convex, with the legs and antennæ and the elytra (except on the disc) obscurely reddish; the head punctulate, stria well-marked laterally, widely interrupted in front; the thorax, marginal stria complete, sides distinctly punctured, disc very finely punctulate, scutellar impression obscurely biarcuate; the elytra minutely punctulate, striæ 1-4 and sutural complete, the two last joining at the base, 5 dimidiate; the pygidia are somewhat closely punctulate, the points varying in size; the prosternum bistriate, keel clearly (not thickly) punctured; the mesosternum, marginal stria complete, close to the edge and feebly crenulate, surface sparingly punctulate, transverse stria finely and evenly crenulate, surfaces of the metasternum and first abdominal segment punctulate; the anterior tibiæ 8-9-denticulate.

The interrupted frontal stria and the colour of the elytra are peculiar to this species amongst those at present known.

*Hab.* Abyssinia. In the British Museum and my own collection.

*Epitoxus ascinus*, sp. n.

Rotundatus, convexus, niger, nitidus; fronte plana, stria antice utrinque sinuosa; pronoto ante scutellum biarcuatim impresso disco lævi lateribus parce punctato; elytris striis 1-4 et suturali integris, 2 posterioribus basi arcuatim junctis, 5 in medio abbreviata; propygidio pygidioque parce punctatis; prosterno bistriato; mesosterno marginato, stria transversa haud crenulato; tibiis anticis 8-denticulatis.

L.  $2\frac{1}{2}$  mill.

This species closely resembles *breviusculus*, Mars. The

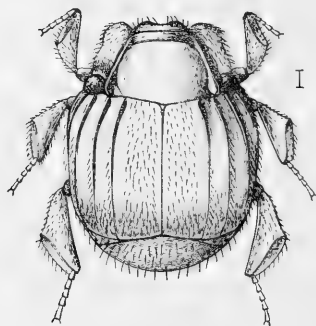
frontal stria, however, is not circular, the disc of the thorax is smooth, the pygidia are less closely punctured, the mesosternum is more finely marginate, and the transverse stria is not crenulate; the metasternum has a few punctures at the base placed transversely near the coxæ.

*E. brevisculus*, Mars. (which has a wide distribution from the Cape to the Congo River), has the transverse mesosternal stria finely yet markedly crenulate; but Marseul did not refer to it. The sutural stria in both species joins the fourth dorsal at the base.

*Hab.* Congo River.

*Hetærius carinistrius*, Lew. Ann. & Mag. Nat. Hist.  
ser. 8, vol. xii. p. 85 (1913).

I believe that only one example of this American species is known, and it is therefore desirable to give a woodcut of it.



*Hetærius carinistrius*, Lew.

#### EXPLANATION OF PLATE IX.

- Fig. 1. Ebonius æquatorius*, Lew.
- Fig. 2. Hister terrenus*, Lew.
- Fig. 3. Althaus teretrioides*, Lew. 3 a. Tibia.
- Fig. 4. Megalocrærus rubricatus*, Lew.
- Fig. 5. Pelorurus carinatus*, Lew.
- Fig. 6. — costipennis*, Lew. 6 a. Pygidia.
- Fig. 7. — densistrius*, Lew. 7 a. Pygidia.
- Fig. 8. Coproxenus opacipennis*, Lew.
- Fig. 9. Terapus bicarinatus*, Lew.

XXI.—*The Tree-Shrews of the Tupaia belangeri-chinensis Group.* By OLDFIELD THOMAS.

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IN Dr. M. W. Lyon's recently issued Monograph of the Tupaiidæ, the Tree-Shrews of Burma and the neighbouring countries are all placed provisionally under the heading of *Tupaia chinensis*, with the admission, however, that they "constitute a somewhat heterogeneous collection." Dr. Lyon also "strongly suspects that future collections will show that *Tupaia chinensis* is a subspecies of *T. belangeri*."

In connection with the receipt of three specimens of this group from Tengyueh (= Momein), Yunnan, nearly topotypes of *T. chinensis*, presented by Mr. E. B. Howell, I have taken the opportunity of examining all the specimens in the Museum, in order to try and clear up the one group of Tupaiidæ left unworked in Dr. Lyon's most valuable Monograph. Except a few recent additions, the specimens have all been examined and enumerated by Dr. Lyon, and their localities inserted in the map on p. 75 of his Monograph.

In the first place, in regard to Dr. Lyon's suspicion as to the specific distinction of *T. chinensis*, I may express my opinion that no satisfactory dividing-line between *T. belangeri* and *chinensis*, as species, can be found. Tenasserim specimens of *belangeri* grade imperceptibly through those of Chiengmai, Siam, into the typical *chinensis* of the Shan States and Yunnan; and I therefore propose to treat all the members of the group as subspecies of *T. belangeri*.

The specimens from Nepal, Sikhim, Cachar, Manipur, Pahang, and Chiengmai—some of which are referred by Dr. Lyon to *T. chinensis*—I should call *T. belangeri belangeri*, as they have some fulvous suffusion on the hinder back, while true *chinensis* is pale olive, quite without warmer suffusion posteriorly.

To *T. belangeri chinensis* I should refer the specimens from Tengyueh and Meechee, Yunnan, and a small series—mostly immature—from the Northern Shan States.

Then, from an intermediate locality in the "dry area" of Burma, we get a form with all the characteristics produced by such dry areas, and distinct enough to form a special subspecies. It may be called

*Tupaia belangeri siccata*, subsp. n.

General colour rather darker than "tawny olive," the head

olive-grey, the posterior back, as in true *belangeri*, with a fulvous suffusion. Shoulder-streaks unusually white, sharply defined, and conspicuous. Under surface white, with scarcely a tinge of buffy, the hairs white to their roots; inner aspect of limbs white, not grey-mixed, the inner side of the hind legs particularly strongly contrasted and markedly different from what is found in the other subspecies.

Skull with the bullæ rather larger than in other subspecies.

Dimensions of type given on p. 66 of Dr. Lyon's Monograph.

*Hab.* Zibugaung, Lower Chindwin.

*Type.* Male. B.M. no. 6. 7. 5. 1. Collected 15th January, 1906, and presented by Capt. A. Mears.

This form is readily distinguishable by its conspicuous white shoulder-stripe, chest, and inner side of hind limbs.

Passing eastwards again from the region inhabited by *belangeri* and *chinensis*, we find the Tree-Shrews becoming darker and more rufous, two series—from Möngtse, Yunnan, and Nan, Siam, respectively—being both distinguished from the more western forms in this way. But they also differ from each other in various ways, and I therefore base on them the two following new subspecies:—

*Tupaia belangeri yunalis*, subsp. n.

Colour much darker than in *belangeri* and *chinensis*, the back more rufous, the rump more blackish grey, therefore in direct contrast to *belangeri*, in which the rump is more rufous than the back. General tone near "mummy-brown," but there is a variation towards the olive-grey of *chinensis*. Rump distinctly darker than back. Under surface grey, washed with whitish, though in some cases the whitish goes to the root of the hairs; but there is never the distinctly contrasted white of subsp. *siccata*. Shoulder-stripes inconspicuous, dull whitish.

Measurements on p. 66 of Dr. Lyon's paper.

*Hab.* S.E. Yunnan. Type from Möng-tsze.

*Type.* Adult female. B.M. no. 12. 7. 25. 45. Collected 10th July, 1910, by H. Orii. Seven specimens.

*Tupaia belangeri laotum*, subsp. n.

General colour rufous brown ("Brussels brown," Ridgway), the rump blackish grey—therefore, again, in contrast to true *belangeri*, in which the fore-back is grey and the hind-back rufous. As compared with *yunalis* the colour is



browner and less "saturate," Shoulder-stripe well marked, more buffy than in *yunalis*.

Skull with slightly larger teeth, larger bullæ, and smaller zygomatic vacuities than in *yunalis*. The differences are all slight, but constant throughout the series available.

Dimensions on p. 66 of Dr. Lyon's paper.

*Hab.* Nan, Siam. Alt. 290 m.

*Type.* Adult female. B.M. no. 98.2.8.12. Original number 23. Collected 19th August, 1897, and presented by Th. H. Lyle, Esq. Eight specimens (five young).

These two eastern subspecies differ from the other forms by their darker colour and tendency to be blackish or dark greyish on the rump. From each other they differ very much as do *chinensis* and *belangeri*, and, in fact, they may be looked upon as eastern representatives of these subspecies respectively, *yunalis* of the olive-grey *chinensis* and *laotum* of the more fulvous *belangeri*, each pair being in about the same latitude.

As Dr. Lyon has carefully recorded where the types of all the various forms of the Tupaiidæ are preserved, I may take this opportunity of mentioning that the typical specimens of *Tupaia lacernata wilkinsoni*, *obscura*, and *longicauda*, and *T. ferruginea penangensis*, described by Messrs. Robinson and Kloss, and hitherto in Selangor, have now been transferred to the British Museum, in accordance with the enlightened policy pursued by the authorities of the Federated Malay States Museum in regard to the preservation of types. In a temperate climate like that of England types do not deteriorate in the same way as, however well taken care of, they do in a tropical one.

XXII.—British Fossil Crinoids.—X. *Sycocrinus Austin*,  
Lower Carboniferous. By F. A. BATHER, F.R.S.

[Plate X.]

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PREVIOUS HISTORY.

The name *Sycocrinites* (or *Sycocrinus*), from σῦκον a fig, was introduced by T. & T. Austin in October, 1842 (Ann. & Mag. Nat. Hist. vol. x. p. 111), for a genus with three species; *S. clausus*, *S. jacksoni*, *S. anapeptamenus*. In that paper neither genus nor species were described, diagnosed,

Ann. & Mag. N. Hist. Ser. 8. Vol. xiii. 17

or figured. It is, however, possible to glean some facts concerning the genus from the position to which it was assigned. Being in the Class Adclostella (Austin), it had a "body covered with closely-jointed calcareous plates, not lobed, and without arms." Being in the Order Columnidæ (Austin), its body was "attached by a jointed . . . column." Of the two Families: Sphæronoideæ (Gray) and Echinocrinoidea (Austin) into which that Order was divided, *Sycocrinus* was placed in the former; we may therefore infer that "pores" were either "wanting" or "scattered irregularly among the plates," and that the "surface" was "smooth," *i. e.* devoid of spines.

In March, 1843, the "Descriptions of several new Genera and Species of Crinoidea," whose names had been introduced in the previous paper, were published by the Austins, and among them the definitions of *Sycocrinus* and its three species (Ann. & Mag. Nat. Hist. vol. xi. p. 206). It is not necessary to reprint these definitions, but, translating them into more modern terminology, we can state the following further facts alleged concerning the genus. In two out of the three species at any rate, the plates of the cup are in three circlets, corresponding apparently to the cup-plates of a simple crinoid with dicyclic base. Each of these circlets consists of five plates, except the proximal circlet (IBB), in which there are three, doubtless formed as usual by fusion of two pairs. The mouth is central and surrounded or covered, in one of these dicyclic species, by five plates corresponding to the so-called orals, in the other dicyclic species by (it is suggested) a plated integument. Supposed orals are also present in the third species. The anus is lateral; its position is given more precisely for only one species, and there it is said to be between what we should call the basal and radial circlets.

Analysing the definitions of the three species given on the same page, we deduce the following:—

*S. clausus*: dicyclic; oral aspect covered by 5 plates; anus between BB and RR.

*S. jacksoni*: monocyclic; oral aspect covered by 5 plates; anus lateral; stem-facet small.

*S. anapeptamenus*: dicyclic; oral aspect not covered, so far as known; anus projecting at the side.

The alleged distinction between *S. clausus* and *S. anapeptamenus* is not great, since the anus may have been in the same position in the two species. *S. jacksoni*, on the other hand, clearly belonged to a different genus.

The geological and geographical distribution of these species are nowhere even hinted at, an omission justly deplored by L. von Buch (1845, 'Ueber Cystideen,' pp. 113-114) when he referred *S. jacksoni* and *S. anapeptamenus* to *Cryptocrinus cerasus*, an Ordovician cystid, having, erroneously I think, interpreted Austin's definitions to mean that the third circlet of plates in *S. anapeptamenus* was homologous with the third circlet in *S. jacksoni*. Von Buch rightly noted the distinction between *S. clausus* (with four circlets) and *S. jacksoni* (with three circlets).

Commenting on this in November 1848 (Quart. Journ. Geol. Soc. vol. iv., Proc. p. 293), T. Austin, F.G.S. [*i. e.* the Fort-Major], appeared to accept Von Buch's reference of two species to *Cryptocrinus*, and explained that they occurred "in the carboniferous limestone of Yorkshire." That statement was probably intended to apply also to *S. clausus*. Similarly in October 1851 (Ann. & Mag. Nat. Hist. ser. 2, vol. viii. pp. 289-290) Fort-Major Austin, in maintaining against Edward Forbes that cystids were found in the Carboniferous rocks, implied that some, if not all, of his specimens of *Sycocrinus* came from "our Mountain Limestone."

H. G. Bronn in 1860 ('Klass. und Ordn.' vol. ii. p. 230) and Dujardin & Hupé in 1862 ('Echinodermes,' p. 70) mentioned the name *Sycocrinites* as a synonym of *Cryptocrinus*, doubtless without independent enquiry.

About twenty years ago the late Mr. R. Etheridge, F.R.S., showed me some drawings by T. Austin (? junior) arranged as a plate in continuation of the Austins' 'Monograph.' Some of these, to my delight, represented the three species of *Sycocrinus*, the names being pencilled on the back of the sheet by Ft.-Major Austin. It was on this evidence, and before I had observed the above-quoted statements as to the horizon, that in 1900 I published the remark: "the authors' MS. drawings suggest that *S. clausus* = *Lageniocrinus*, *S. jacksoni* = *Cryptocrinus*, and *S. anapeptamenus* = *Hypocrinus*" ('Treatise on Zoology,' vol. iii. p. 203). With the fairly clear evidence of the figures before me, I had not troubled to compare them with Austin's published definitions. Had I done so I should have detected a mistake in Austin's own reference. It is quite plain that in his roughly pencilled note he transposed the numbers 3 and 4, which should refer to *S. clausus* and *S. jacksoni* respectively. Only thus can the drawings in question be made to agree with the definitions. Had I observed this, I would have written "*S. jacksoni* = *Lageniocrinus*, *S. clausus* = *Cryptocrinus*."

## REDESCRIPTION.

The Austin Collection of Echinoderms, accompanied by a list in the handwriting of Fort-Major Austin, is in the Public Museum of Liverpool, and contains a fair number of the specimens described or figured by the Austins. The specimens are gummed on wooden tablets, and provided with labels copied from the somewhat unclear MS. list. When, thanks to the facilities afforded by the Director, Dr. Clubb, I recently made a careful inspection of the collection, I found only two tablets purporting to bear specimens of this genus. They were labelled “(369) *Lycocrinus anapetalamenus*” and “(370) *Lycocrinus jacksoni*,” a circumstance which possibly explains why *Sycocrinites anapetalamenus* had been lost sight of.

Taking now the evidence of the drawings (reproduced on Plate X., with Austin's original numbering 2-4*b*), of the MS. list, of the tablets, and of the specimens on the tablets, I propose to deal with the three species in order.

*Sycocrinus jacksoni*.

Tablet 370 in the Austin Collection is labelled as bearing this species, which should be represented by a single theca. But the sole specimen on the tablet is a very clear example of the blastoid “*Astrocrinus tetragonus* Austin,” which, without much doubt, has fallen off tablet 371, to which it properly belongs and where there is a gummed space for it, and has been stuck by mistake on tablet 370. The original specimen 370 must have disappeared before that took place, and is not likely ever to be found.

The MS. list says that the original specimen came from the Carboniferous Limestone of Settle. This runs counter to Von Buch's suggestion, based on the description, that the specimen was a *Cryptocrinus*. Renewed examination of the figures in this new light is required.

The drawings (Pl. X. figs. 4-4*b*) represent a theca composed of three circlets of plates. The proximal circlet consists of one small and two large plates, together forming a pentagonal base (fig. 4*b*). The second circlet consists of five pentagonal plates, with the shield shape characteristic of ordinary radials. The third, or uppermost circlet consists of five triangular plates, not alternating with the radials but continuing them in the same way as ordinary brachials. On one of these plates, apparently a little below and to the left of its centre, is a circular excrescence, which in one

figure (fig. 4) is drawn as pierced by a small pore, considered by Austin as an anal pore, but much smaller in proportion than the usual anal channel of a pelmatozoön. Although no statement is made and no representation of the actual size is given, still it seems probable that these figures agree with those of the other species in being enlarged some three or four diameters.

Comparison of the figures with those of the Viscan species *Lageniocrinus seminulum*, De Koninck and Lehon (1884, 'Recherches s.l. Crin.', p. 187, pl. vii. ff. 1 *a, b, c*), will confirm my previous reference of the drawings of this species to *Lageniocrinus*. If, however, that be correct, then the supposed anus is probably a parasitic boring or some adherent foreign body.

*Lageniocrinus* is, as I have suggested (1900, 'Treatise,' p. 152), probably the young of *Symbathocrinus*. The five triangular plates are the first stages of the arms, and subsequent brachials would appear at their distal ends. This is borne out by Austin's fig. 4 *a*, which shows a slight excavation at the apices, with apparently a minute pore in each. These may be interpreted as the facets for the second brachials, with the opening of the ventral groove.

### *Sycocrinus clausus*.

This is not represented in the Austin Collection, so that the locality and horizon are still a little uncertain (*vide supra*), and our information is confined to the published definition already analysed and the MS. drawings reproduced in Pl. X. figs. 3-3 *e*.

The figures are clear in all respects except the orientation of the small infrabasal, a very important point. They are consistent with its position either in the r. post. radius, as in *Flexibilia*, or in the anterior radius, as in *Dicyclia Inadunata*.

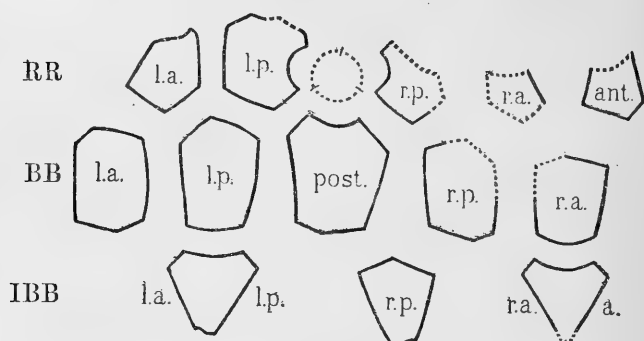
The five summit-plates, with their tri-radiate central suture (fig. 3 *d*), are of the type usually termed "orals," and there are no traces of any arm-facets on the radials. It will, however, be noted that the specimen itself was very small, and the facets might easily have escaped observation.

In the absence of the actual specimen, I do not feel inclined to speculate as to the precise position of this form. It may, not improbably, have been a Gasterocomid allied to *Hypocrinus schneideri* and "*Lecythiocrinus*" *adamsi*, if not actually congeneric with one or other of them; or it may conceivably have been, as Austin supposed, congeneric with

*Sycocrinus anapeptamenus*. What that form really is, we now enquire.

*Sycocrinus anapeptamenus*.

Tablet 369 in the Austin Collection should, according to the MS. list, bear three specimens of this species, from the Carboniferous Limestone of Settle, Yorkshire. One of these specimens has disappeared, as had already been noted on the copy of the list made by a former curator of the museum. One of the two remaining specimens proves to be only some plates of a *Palechinus* with no trace of any crinoid. The third specimen is not the one drawn by T. Austin, jun. (our Pl. X. figs. 2-2 d), but is of the same general character and agrees with the published definition. There is no reason for doubting that this extant specimen was among those before the Austins when they drew up their first account of the genus, and I therefore select it as the holotype of the species.



Analysis of the cup of *Sycocrinus anapeptamenus*, lecto-holotype. Suture-lines inferred from markings on the internal cast alone, or outlines otherwise restored, are in dotted line. The missing portion of l. post. R. was broken off in removing the thick gum and matrix from the specimen; the outline is fully warranted.  $\times 3$  diam.

The specimen (Pl. X. figs. 1 a-1 c) consists of a theca devoid of all plates above the radials and somewhat broken, but the disposition of all the cup-plates can be determined (text-fig.). The theca is asymmetrical, there being a general lessening in height, in all circlets, from the l. post. radius to the r. ant. interradius.

The height of the theca from the stem-facet to the summit of l. post. R., is 9.7 mm.; to the summit of the r. ant. inter-radial suture, 7.7 mm. Diameter: antero-posterior, 6.4 mm.; transverse, about the same.

IBB 3, two large and one, the r. post., small. Height of r. post. IB, 3.9 mm. Stem-facet circular, not clearly seen; diameter, circa 1.5 mm. The facet slopes in accordance with the general asymmetry of the theca. Austin's fig. 2a shows a minute lumen and a finely ridged border.

BB 5; l. ant. and r. post. hexagonal; in post. B the upper angle is truncated by the periproct; in l. post. and r. ant. BB the lower margins meet in a curve, making the plates pentagonal. Post. B is the largest, its height and width being 4.7 and 4.55 mm.; r. ant. B is the smallest, its height and width being 4.3 and 3 mm.

RR 5, in general form more or less shield-shaped, but variously modified and unequal in size. The largest is l. post. R, which projects upwards higher than the others, with its shoulders sloping up to a truncated flattened surface, which may be an arm-facet; on its right side this radial is excavated below by the periproct. Next in size are l. ant. R, which slopes up to l. post. R, and r. post. R. The latter on its left side is excavated below by the periproct, and is produced above so as to arch over the periproct; in this region either it meets l. post. R or is separated from that plate by a small anal plate; I rather incline to the latter interpretation, but the evidence is none too clear. The remaining radials, r. ant. R and ant. R, were still smaller; r. ant. R is broken away, but its outline can be reconstructed; it was probably the smallest of the five. Thus, in accordance with the general asymmetry, there is a slope of the upper surfaces of the radials, down from the projecting l. post. R to r. ant. IR.

The brachial facets cannot be distinguished, but, as seen from above (fig. 1b), the radials bound a rather irregular opening, to which an angular excavation of the upper margins of the radials tends to give a pentagonal character. Whether in the living state this was covered by orals, tegminals, or reduced brachials is uncertain; at any rate it was uncovered in all the fossils known to the Austins, and this fact no doubt it was that suggested the trivial name *anaeptamenus* (lying open), in distinction to *clausus*.

In considering the Relations of *Sycocrinus anapeptamenus*, it is seen at once that they are very close to "*Hypocrinus*" *piriformis*, and thus far my former suggested reference of this British species to *Hypocrinus* is confirmed. I have, however, recently shown that *H. piriformis* is no *Hypocrinus* but a *Taxocrinid* (Proc. Zool. Soc. 1913, p. 910). The difference between it and *S. anapeptamenus* lies essentially in the greater size of the right posterior radial in the

latter; and this carries with it, first the bounding of the periproct by that radial, instead of by a reduced right posterior radial and the adjoining right anterior radial; secondly the position of the periproct in the middle line of the posterior basal, instead of at the adjacent upper corners of the posterior and right posterior basals.

There are, however, distinct modifications from a normally symmetrical crinoid. The whole cup is raised along the left posterior radius, and depressed towards the opposite side, and this position was accentuated by the slope of the stem-facet. The asymmetry of the radial region is shown in Austin's reconstruction (Pl. X. fig. 2 *e*), but the slope of the stem-facet is not shown and would be inconsistent with such a stem and general habitus as are represented in that drawing.

Further, there seems good reason to suppose that the arm borne by the left posterior radial was relatively stout, but that the other arms were much reduced, and possibly modified into flattened plates serving more for protection of the peristome than for the collection of food (Pl. X. fig. 1 *d*). Austin's reconstruction is certainly incorrect in showing five small arms of equal size.

The general shape of the posterior basal is like that in *Cydonocrinus* (Ann. & Mag. Nat. Hist., Nov. 1913, p. 388), but the periproct was definitely closed above by the union of the radials, with or without a small intercalated plate. There is no reason to doubt the correctness of Austin's representation of a small anal tube projecting outwards from the periproct (Pl. X. fig. 2 *b*).

In all these modified features, *Sycocrinus anapeptamenus* is much nearer to "*Hypocrinus*" *piriformis* than to such a form as *Cydonocrinus*, and it may indeed be questioned whether the two species should be separated generically. Apart from difference of size, the only distinction lies in the slight intensification of all the above-mentioned features in "*H.*" *piriformis*.

The **Systematic Conclusions** to which we are led seem to be these. *Sycocrinus* was described by the Austins in terms that were intelligible enough to contemporary writers, as proved by the remarks of Von Buch. Our analysis of their definitions has, however, brought out rather more clearly the fact that at least two quite distinct plans of structure—the monocyclic and the dicyclic base—were confused by them. The dicyclic plan seems to be that most in accord with the intention of the generic diagnosis, and we may



therefore eliminate the monocyclic *S. jacksoni*. Of the two dicyclic species I select *S. anapeptamenus* as the genotype; and if reasons for this course be required, there are two good ones: first, it was the species chosen for reconstruction, so as to give Austin's idea of the genus; secondly, it is the only one of which an authentic original specimen is known, which specimen I have above selected as the holotype.

*Sycocrinus* therefore stands, with genotype *S. anapeptamenus*; and even if Austin's account was not perfectly satisfactory, the essential characters of the genus are now, I trust, quite intelligible.

To this genus I also refer "*Hypocrinus*" *piriformis* Rothpletz.

To include the two species the generic diagnosis drawn up to receive "*H.*" *piriformis* may now be slightly modified (*cf.* Proc. Zool. Soc. 1913, p. 912).

**Diagnosis of *Sycocrinus*.**—A Taxocrinid with no radianal, with large IBB forming a conspicuous part of the cup, with left post. R and arm enlarged and all others reduced in size, with rectum passing out between BB and RR, being bounded either by post. B, l. post. R, and r. post. R, or by those plates and by r. post. B and r. ant. R in addition.

**Habits.**—The asymmetry of *Sycocrinus* suggests that, like many of the similarly asymmetric Eugeniocrinidae, it was a reef-dweller, fixed to a rocky shore by a short stem, and exposed to a food-bearing current of some force flowing in one direction. The cup, one supposes, was so placed that the inner side of the large left posterior arm faced the current. The same current that brought the food-particles would have swept away the faecal stream as it issued from the laterally projecting anal tube (Pl. X. fig. 1 *d*).

**Geological Age**—The limestone at Settle, whence all the Austins' specimens were obtained, is in the *Dibunophyllum* zone; the precise horizon from which they were collected is unknown.

I cannot close this note without recurring to the question of the age of the Timor pelmatozoa. I have previously remarked on the Lower Carboniferous affinities of *Schizoblastus* (1908, N. Jahrb. f. Mineral., Beil. Bd. xxv. p. 318). *Sycocrinus* now appears both in Timor and in our Lower Carboniferous. And perhaps Dr. Wanner will allow me to state that in my coeval *Cydonocrinus* he has recognized another form found by him also in Timor. Even *Hypocrinus* may be represented in Yorkshire by "*Sycocrinus*"

*clausus*. Can it then be denied that the Timor echinoderms are clearly of Carboniferous age? One would even suppose them to be Lower or at least Middle Carboniferous. Other constituents of the fauna are said to be Artinskian, and therefore Permian; but after all, what is "Artinskian"? I do not propose to attempt an answer to that question, but I insist that no answer will be satisfactory which fails to recognize the markedly Carboniferous character of the Echinoderm elements of the fauna.

#### SUMMARY.

*Sycocrinus* T. & T. Austin, 1843, is discussed on the evidence of the Austins' published definitions, unpublished figures, MS. list, and one specimen of *S. anapeptamenus* in the Austin Collection at the Liverpool Museum.

All the species came from the Viséan *Dibunophyllum* zone, of Settle, Yorkshire.

*S. anapeptamenus* is fixed as genotype, and *Sycocrinus* re-diagnosed as a Taxocrinid, including also "*Hypocrinus*" *piriformis* Rothpletz. Its peculiarities are probably due to a reef-habitat.

*S. clausus* may be an independent species of *Sycocrinus*, or may be a *Hypocrinus*; but in the absence of any known specimen, its precise generic position remains uncertain.

*S. jacksoni* is, like *Lageniocrinus seminulum*, probably the young of a *Symbathocrinus*.

The occurrence of *Sycocrinus*, *Cydonocrinus*, and possibly *Hypocrinus*, in both England and Timor, confirms the author's previously expressed views as to the Carboniferous age of the Timor fossil Echinoderms.

#### EXPLANATION OF PLATE X.

*Fig. 1.* *Sycocrinus anapeptamenus* Austin: three views of the lecto-holotype,  $\times 4$  diam., drawn by A. H. Searle\* under the Author's direction.

*Fig. 1 a.* Posterior aspect.

*Fig. 1 b.* Oral aspect; the outlines of the destroyed plates are dotted in.

*Fig. 1 c.* From the left anterior interradius.

*Fig. 1 d.* Imaginary reconstruction of the animal, from the right posterior interradius,  $\times 2$  diam. F. A. B.

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\* Many naturalists, and not least those occupied with fossil echinoderms, will regret the sudden death of Arthur Hodson Searle, which occurred on the first day of this year. It has often been my pleasure to record my indebtedness to his care, intelligence, and skill.

The remaining figures are fascimiles of those by T. Austin. The following legend is also copied from Austin's MS., except for words within [ ], and except that, for the reasons given in the text, the names *clausus* and *jacksoni* have been transposed:—

Fig. 2. *Sycocrinus anapectamenus*.

Fig. 2. Natural size.

Fig. 2 a. Lateral aspect. [× 3 diam.]

Fig. 2 b. A different lateral view. [× 3 diam.]

Fig. 2 c. Ventral aspect. [× 3 diam.]

Fig. 2 d. Dorsal aspect. [× 3 diam.]

Fig. 2 e. [Reconstruction. × 2 diam. Austin's figure is tinted yellow and pink.]

Fig. 3. *Sycocrinus clausus*.

Fig. 3. Natural size.

Fig. 3 a. Lateral aspect, magnified. [× 3·5 diam.]

Fig. 3 b. Lateral aspect showing the circular opening into the interior. [× 3·5 diam.]

Fig. 3 c. Lateral view on a different side to the two before specified. [× 3·5 diam.]

Fig. 3 d. View of the apex showing the base of the protrusive pore. [× 3·5 diam.]

Fig. 3 e. Dorsal aspect. [× 3·5 diam.]

Fig. 4. *Sycocrinus jacksoni*.

Fig. 4. Lateral view showing the pore. [× ca. 3 diam.]

Fig. 4 a. The apex showing the excentric pore. [× ca. 3 diam.]

Fig. 4 b. The dorsal apex. [× ca. 3 diam.]

XXIII.—On a small Collection of Earthworms from Henderson Island. By Dr. LUIGI COGNETTI DE MARTIIS, R. Museo Zoologico, Torino.

By the courtesy of Prof. F. J. Bell, of the British Museum, I am able to give the first notification on the Oligochaeta of the Henderson or Elizabeth Island in the South Pacific. The small collection dealt with in the present paper was collected by Mr. David Tait. In the collection only two species of the same genus are to be found, as follows:—

*Pheretima hendersoniana*, sp. n.

Four specimens.

*External characters*.—Length 80–108 mm., breadth 4·5–6 mm. behind the clitellum. Segments about 120.

Colour brownish dorsally at the preclitellian segments, pale brownish or whitish elsewhere. Prostomium propilobous ( $\frac{1}{2}$ ).

Setæ arranged in continuous rings: 32/ii., 35/iii., 46/vi., 65/x., 70/xiii., 70/xxii.; there are no dorsal and ventral gaps. The setæ of the anterior and caudal segments are slightly stronger.

First dorsal pore in intersegmental furrow xii./xiii.

Clitellum embracing segments xiv.-xvi., unprovided with intersegmental furrows. The setæ are wanting on the clitellum.

Male pores in the ring of setæ of the xviii. segment; between the male pores the setæ are wanting. On segments xvii. or xix. there are about seven setæ between the lines of male pores. The distance between the lines of male pores corresponds to  $\frac{1}{4}$  of the segment circumference.

Paired papillæ are present on segments xix. and xx., one pair for each segment, close to the middle ventral line, behind the ring of setæ. A third pair of papillæ, or a single lateral papilla, may be present in the same position on the xxi. segment. In one specimen a pair of papillæ is present on the viii. segment, in front of the ring of setæ, and about in the same lines with the papillæ above mentioned.

On the xix. and xx. segments there is also present a pair of papillæ, or a single lateral papilla, behind the ring of setæ; these papillæ are disposed laterally to the lines of the male pores. The distance between the *lateral* papillæ of each pair corresponds to about  $\frac{1}{4}$  of the segmental circumference.

Female pore on the xiv. segment, in a little grey area surrounded by a white ring. Spermathecal apertures in intersegmental furrows vii./viii. and viii./ix., about in the same lines with the male pores, slightly closer ventrally.

*Internal anatomy.*—Septa iv./v.-vii./viii. are moderately thickened; gizzard septa viii./ix. and ix./x. are wanting. Gizzard very strong, just behind septum vii./viii. The sacculated intestine begins in the xv. segment, and is provided at the xxvi. segment with a pair of cæca which extend forward through four segments. The cæca are simple in structure. Hearts paired in segments x.-xiii.

The sperm-capsules in segments x. and xi. are ventral to the œsophagus; those of the same segment do not seem to communicate with each other, but the capsules of the x. communicate with those of the following segment through septum x./xi. Sperm-sacs paired in xi. and xii. segments.

The spermiducal glands are rather large, and extend through segments xvii. and xviii. Each gland is a white reniform body, compressed between the body-wall and the

gut; its dorsal edge is very convex and divided into 3 to 5 lobes. From the hilum of each gland originates a cylindrical muscular duct, which describes an **S** and opens directly to the exterior; the terminal bursa copulatrix is wanting.

Spermathecae, two pairs, in viii. and ix. segments. Each spermatheca has a medial long and slightly bent muscular duct. The main pouch has the same length, and is clearly distinct from the duct. The diverticulum ends in a spherical or oval distal extremity; it is longer than the main pouch. The duct of the diverticulum is **S**-shaped at its base and diminishes in breadth at the same region (text-fig.). Before and



*Pheretima hendersoniana*, sp. n. Spermatheca,  $\times 6$ .

behind each spermathecal pore, at the internal surface of the body-wall, a whitish glandular mass (*gl.*) is recognizable.

*Loc.* Henderson Island, S. Pacific (D. Tait coll.).

*Pheretima montana*, Kinb., subsp. *arthuri* (Benham).

Two specimens.

*Loc.* Henderson Island, S. Pacific (D. Tait coll.).

The two specimens agree particularly with Benham's description and figures of *Perichæta arthuri*, Benh.\*. This species is arranged by Beddard † in the synonymic list of *Ph. montana*, Kinb., with a number of other species; but more recently Ude ‡ separates them again as a distinct species. I prefer a middle course, and give to Benham's *P. arthuri* the rank of subspecies only.

In a specimen from the above locality the following characters are noticeable: the spermathecae open to the exterior in intersegmental furrow vii/viii., but lie in the vii. segment; instead of a single median female pore, there are two female pores close to the middle line on the ventral side of the xiv. segment.

\* Journ. Linn. Soc., Zool. xxvi. 1897, p. 212, pl. xvi. fig. 4 a, b.

† Proc. Zool. Soc. London, 1900, p. 620.

‡ Zeitschrift f. wiss. Zool. lxxxiii. p. 448.

XXIV.—On the Crustacean Genus *Sicyonella*, Borradaile.  
By W. T. CALMAN, D.Sc.

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SINCE the publication of my recent paper on *Aphareocaris*, Dr. H. Balss of Munich has kindly drawn my attention to the similarity between this genus and *Sicyonella*, established by Borradaile in 1910 for a species obtained by Prof. J. Stanley Gardiner in the Western Indian Ocean. By the kindness of Mr. Borradaile and of Mr. L. Doncaster, Superintendent of the Museum of Zoology, Cambridge, I have been able to examine the type-material of *Sicyonella maldivensis*, with the result that this species proves to be identical with my *Aphareocaris elegans* from Torres Straits. The synonymy of the genus must therefore stand as follows:—

Genus *SICYONELLA*, Borradaile.

*Aphareus*, Paulson, Izsljedovaniya Rakoobraznuikh Krasnagho Morya, Kiev, 1875, p. 117. (Nom. praeocc.)

*Sicyonella*, Borradaile, Trans. Linn. Soc., Zool. xiii. 1910, p. 259.

*Aphareocaris*, Calman, Journ. Linn. Soc., Zool. xxxii. 1913, p. 219.

The discrepancies between Borradaile's description and mine are, for the most part, easily explained on comparing the type-specimens. The "antennal teeth" of the carapace in Borradaile's account are really supraorbital in position, while his "branchiostegal" tooth is that which I called hepatic. The relative length of the third maxillipeds and the subdivision of their terminal segments are exactly similar in the two forms. In dealing with the branchial system Borradaile has (1) reckoned as arthrobranchs the podobranch of the second maxilliped and the anterior pleurobranchs of the five following somites, (2) assigned to the last thoracic somite the posterior pleurobranch of the somite in front, and (3) omitted to notice the vestigial pleurobranchs. On all these points error is very easy, and even careful examination may leave room for difference of opinion, but I still believe that my version of the branchial formula is substantially correct.

The most serious obstacle to the identification of the two species is that presented by the petasma. As Borradaile's figure of this is on a small scale I give an enlarged figure taken from one of his specimens, from which it will be seen that the organ differs widely from that figured in my former paper, especially in the complex branching of the middle

lobe. It now seems highly probable, however, that the Torres Straits specimen is immature\*. Its length, 20 mm., is less by some 5 mm. than that of the smallest male from the Indian Ocean, and it resembles the females and differs from the males in having (1) the eyes less dilated, (2) the third cheliped less slender and with shorter carpus, and (3) the inner flagellum of the antennules only slightly thickened at the base; in the males, the basal part is considerably



*Sicyonella maldivensis*, adult male (co-type). A. Petasma, seen from in front. B. Apical portion of same, from behind.

thickened and excavated on the inner and upper side, where it bears a row of strong spines. The differences in the proportions of the eyes and third chelipeds are shown by the following measurements (in millimetres) :—

|                            | Indian Ocean. |      | Torres Straits. |
|----------------------------|---------------|------|-----------------|
|                            | ♂.            | ♀.   | ♂.              |
| Total length .....         | 30            | 29   | 20              |
| Ocular peduncle :          |               |      |                 |
| Diameter at base .....     | ·45           | ·48  | ·34             |
| Diam. of corneal area .... | 1·12          | ·76  | ·56             |
| Third cheliped :           |               |      |                 |
| Carpus, length .....       | 3·2           | 2·88 | 2·24            |
| Propodus, length .....     | 2·2           | 2·08 | 1·6             |
| " diameter .....           | ·13           | ·18  | ·16             |
| Dactylus, length .....     | ·52           | ·68  | ·48             |

While it is thus fairly clear that *Aphareocaris elegans* must be regarded as a synonym of *Sicyonella maldivensis*, it is to be noted also that the distinctions which I pointed out

\* The changes in the petasma of *Sergestes* during growth have recently been described by Stephensen ["The Copulatory Organ (Petasma) of *Sergestes vigilax* (Stimpson), H. J. H.," *Mindeskript for Japetus Steenstrup*, København, 1913, pp. 1-5 (sep. copy)].

between it and the still earlier *Aphareus inermis* of Paulson tend to lose their importance. One specimen among Borradaile's material has the rostral crest shaped almost exactly as in Paulson's figure, owing, apparently, to the breaking of the anterior tooth; the greater stoutness of the third cheliped as figured by Paulson is not likely to be a valid specific character in view of the great difference between the sexes in this respect; and the number of articulations in the penultimate segment of the third maxilliped is sometimes difficult to determine unless the limb be removed from the body. The decision on this point, however, may be left to Dr. Balss, who, I understand, has under examination specimens belonging to this genus from the Red Sea.

There remains for consideration the systematic place to be assigned to the genus, and on this point I find myself unable to agree with Borradaile's suggestion that its affinities are with the Sicyoninae. The characters enumerated in my former paper appear to show conclusively that it belongs to the Sergestidae, and in addition it may be pointed out that the branched form of the adult male petasma is very suggestive of that found in *Sergestes* [cf. Kemp, Fisheries, Ireland, Sci. Invest. 1908, i. (1910) pl. iii. figs. 11 & 14] and quite unlike that of *Sicyonia*. The modification of the inner flagellum of the antennule in the adult male, as described above, is probably to be compared with the prehensile apparatus of *Sergestes*, although the flagellum is not bifurcated as in that genus.

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XXV.—*Fishes from Yunnan, collected by Mr. John Graham, with Description of a new Species of Barilius.* By C. TATE REGAN, M.A.

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DURING the last ten years Mr. John Graham has from time to time sent several small collections of fishes from Yunnan to the British Museum; one just received is likely to be the last, as Mr. Graham is leaving Yunnan; it includes examples of a new *Barilius*.

*Barilius alburnops*, sp. n.

Depth of body  $4\frac{1}{2}$  to 5 in the length, length of head  $3\frac{1}{2}$  to 4. Snout nearly equal to diameter of eye, which is  $3\frac{2}{3}$  to 4 in



the length of head and equal to or a little less than inter-orbital width. Mouth oblique; maxillary not extending to below eye; no barbels. Scales 76 to 84, 12 or 13 from dorsal fin to lateral line, 3 from lateral line to base of pelvics. Dorsal 10, with 7 branched rays; origin just behind base of pelvics, nearer to caudal fin than to end of snout. Anal 16-18, with 13 to 15 branched rays. Pectoral extending  $\frac{3}{5}$  to  $\frac{3}{4}$  of distance from its base to pelvics. Caudal forked. Caudal peduncle twice as long as deep. Silvery; back olivaceous; fins immaculate.

Yunnan Fu.

Several specimens, 150 to 200 mm. in total length.

It may, perhaps, be of interest to give a complete list of the fishes sent by Mr. Graham from Yunnan; all the new species have been described in the 'Annals,' and the dates appended will facilitate reference to the original descriptions:—

|  |   |
|--|---|
| <i>Cyprinus carpio</i> , Linn.                 | <i>Misgurnus anguillicaudatus</i> , Cantor.   |
| — <i>micristius</i> , Regan, 1906.             | <i>Nemachilus pleurotaenia</i> , Regan, 1904. |
| <i>Carassius auratus</i> , Linn.               | — <i>nigromaculatus</i> , Regan, 1904.        |
| <i>Barbus grahami</i> , Regan, 1904.           | — <i>oxygnathus</i> , Regan, 1908.            |
| — <i>yunnanensis</i> , Regan, 1904.            | — <i>grahami</i> , Regan, 1906.               |
| <i>Discognathus yunnanensis</i> , Regan, 1907. | — <i>mongolicus</i> , Bleek.                  |
| <i>Oreinus grahami</i> , Regan, 1904.          | <i>Silurus mento</i> , Regan, 1904.           |
| <i>Schizothorax taliensis</i> , Regan, 1907.   | — <i>grahami</i> , Regan, 1907.               |
| <i>Achilognathus barbatulus</i> , Günth.       | <i>Pseudobagrus medianalis</i> , Regan, 1904. |
| <i>Acanthorhodeus elongatus</i> , Regan, 1903. | <i>Liobagrus nigricauda</i> , Regan, 1904.    |
| <i>Barilius polylepis</i> , Regan, 1904.       | <i>Ophiocephalus argus</i> , Cantor.          |
| — <i>andersoni</i> , Regan, 1904.              | <i>Monopterus javanensis</i> , Lacep.         |
| — <i>grahami</i> , Regan, 1908.                |   |
| — <i>alburnops</i> , Regan, 1914.              |   |

XXVI.—Two new Cyprinid Fishes from Waziristan, collected by Major G. E. Bruce. By C. TATE REGAN, M.A.

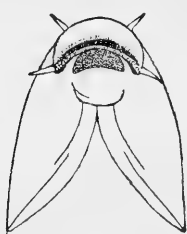
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MAJOR G. E. BRUCE has presented to the British Museum a small collection of fishes made in the Wana Toi, a tributary of the Gomul River in Southern Waziristan (32° 20' N., 69° 30' E., altitude 4500 feet). Six species are represented: four of these, *Callichrous pabda*, Ham. Buch., *Barilius*

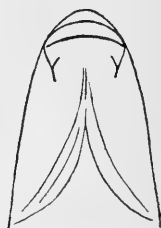
*vagra*, Ham. Buch., *Scaphiodon irregularis*, Day, and *Crossochilus barbatulus*, Heck., are already known; the other two are described below as new to science.

### SCHIZOCYPRIS, gen. nov.

Closely related to *Schizothorax*, Heck., and *Schizopygopsis*, Steind., differing in scaling, structure of mouth, and pharyngeal dentition. Body in great part covered with small scales, but thorax, abdomen, and a mid-dorsal strip naked. Mouth transverse, inferior; barbels absent, or a minute posterior pair; lower lip developed only at corners of mouth; lower jaw without horny sheath. Pharyngeal teeth 2 . 3 . 4—4 . 3 . 2, compressed, with flat grinding-surfaces. Dorsal fin with a strong serrated spine.



A.



B.

Lower surface of head of A. *Discognathus waneae* ( $\times 2$ ) and B. *Schizocypris brucei*.

### *Schizocypris brucei*, sp. n.

Depth of body 4 to 5 in length, length of head  $4\frac{1}{4}$  to  $4\frac{2}{3}$ . Snout  $1\frac{2}{3}$  diameter of eye, which is 5 in length of head; interorbital width 3. Width of mouth  $\frac{1}{2}$  width of head. Dorsal III 8; origin equidistant from anterior margin of eye and base of caudal, above posterior part of base of pelvics; first branched ray longest,  $\frac{3}{5}$  to  $\frac{2}{3}$  length of head; free edge of fin straight. Anal III 6. Pectoral extending a little more than  $\frac{1}{2}$  distance from its base to pelvics, which do not reach vent. Caudal forked. Caudal peduncle twice as long as deep. Back bluish grey, with or without darker spots; lower parts white; fins yellow, tinged with pink.

Ten specimens, the largest 140 mm. in total length.

*Discognathus wanæ*, sp. n.

Depth of body 4 in the length, length of head  $4\frac{1}{3}$  to  $4\frac{2}{3}$ . Snout rounded, nearly as long as postorbital part of head; diameter of eye 5 in length of head; interorbital region flat, its width nearly  $\frac{1}{2}$  length of head. Width of mouth  $\frac{1}{3}$  length of head; two barbels on each side, shorter than diameter of eye. Upper lip with minute papillæ near the margin; lower very narrow; behind it a circular disc divided into a papillose anterior and a smooth posterior portion, and with only the posterior edge free. Dorsal III 7; origin equidistant from tip of snout and base of caudal; first or second branched ray longest, nearly as long as head. Anal II 5. Pectoral extending  $\frac{3}{5}$  of distance from its base to pelvics, which nearly or quite reach vent. Caudal deeply emarginate. Greyish, mottled with darker.

Five specimens, the largest 80 mm. in total length.

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XXVII.—*On certain recently described Australian Species of Tabanus.* By ERNEST E. AUSTEN.

(Published by permission of the Trustees of the British Museum.)

THE following notes, which relate to a paper published last year\* by Mr. Frank H. Taylor, F.E.S., Entomologist to the newly established Australian Institute of Tropical Medicine, at Townsville, Queensland, are written in no spirit of churlish criticism, but solely with a view to assist other workers at an important family of Diptera, the study of which is beset with peculiar difficulties. The descriptions of the older authors relating to this family are almost always unsatisfactory and incomplete, and, based as they too often were on rubbed or otherwise damaged specimens, are frequently misleading. It follows, then, that their correct interpretation is in many cases well-nigh impossible for those who are unable to examine the types, and are unassisted by access to a well-equipped library or a large collection of accurately determined material. In the case of *Tabanidæ*, again, Australia appears to be peculiarly rich in groups of

\* Cf. 'Australian Institute of Tropical Medicine, Report for the Year 1911' (Sydney: Angus and Robertson, Ltd. London: The Oxford University Press, 1913). Pp. 60-70, and pl. xiv.—The title-page of this publication bears no date, but the writer has been informed by Mr. Taylor that the Report appeared in May, 1913.

species, the members of which resemble one another so closely that extreme care is necessary for their discrimination. Lastly, it cannot be too strongly impressed upon all writers on Tabanidæ that in a genus like *Tabanus* (in which plastic differences between species are seldom obvious, while, on the other hand, the number of described species already amounts to considerably more than nine hundred) descriptions, if they are to admit of correct interpretation, must be *comparative* (*i. e.* must include a reference to allied species, and clearly indicate the points in which the supposed new species differs from them), and should always, if possible, be accompanied by a figure carefully drawn by a competent artist. Photographic illustrations are seldom satisfactory, since the imperfections of the particular specimen figured, which are reproduced only too faithfully, frequently obliterate many of the specific characters.

The British Museum (Natural History) is much indebted to Mr. Taylor for the generous gift of paratypes of all the species of *Tabanus* described by him in his paper as new, as well as examples of all but one of those re-described by him under previously existing names, and the study of these specimens has greatly facilitated the preparation of the sub-joined notes.

"*Tabanus abstersus*, Walker" (p. 60, pl. xiv. fig. 14) \*.—*Tabanus abstersus*, Walk. (Ins. Saund., Dipt. pt. i. p. 58, 1850), = *T. circumdatus*, Walk. (List Dipt. Ins. in Coll. Brit. Mus., i. p. 185, 1848). Mr. Taylor's figure, which shows an insect in which the majority of the veins in the distal half of the wings are strongly infuscated over the greater portion of their extent, has nothing to do with *Tabanus circumdatus*, Walk. (syn. *T. abstersus*, Walk.), in which the wings are hyaline and the veins are not infuscated, but looks like *T. limbatinevris*, Macq. (Dipt. Exot., Suppl. iv. p. 29 (1850), nec *T. limbatinevris*, Macq., *op. cit.* Suppl. ii. p. 16, 1847). The ♀ specimen forwarded by Mr. Taylor, however, as an example of the species regarded by him as *Tabanus abstersus*, Walk., belongs neither to *T. circumdatus*, Walk., nor to *T. limbatinevris*, Macq. (1850), but to a species unknown to the present writer. In the specimen sent the angle on the upper margin of the expanded portion of the third joint of the antennæ is produced into a long thumb-like process, much as in *Rhinomyza*, while the ground-colour of the dorsum of the abdomen (with the exception of the lateral

\* The details in brackets refer to Mr. Taylor's paper.

margins and posterior angles of the first four segments, and a white-haired median fleck on the hind margin of each of the first five segments) is entirely black.

"*Tabanus fuscipes*, n. sp." (p. 62, pl. xiv. fig. 15).—The name *fuscipes* is preoccupied by *T. fuscipes*, Ricardo, 1908 (for a species found in South and Central Africa). The writer therefore ventures to propose the designation *Tabanus taylori* for the species under consideration.

Judging from the specimen sent to the British Museum, the description of the legs would seem to be partly misleading; the femora and tibiæ are *cinnamon-coloured*—a very different thing from "clove-brown."

"*Tabanus gregarius*, Erich." (p. 63, pl. xiv. fig. 16).—This is not *Tabanus gregarius*, Erichs., and does not even agree in any way with the original description of that species. It is a *species nova*.

"*Tabanus lineatus*, n. sp." (p. 65, pl. xiv. fig. 17), = *T. rufinotatus*, Big. (syns. *T. elestæm*, Summers, Ann. & Mag. Nat. Hist. ser. 8, vol. x., Aug. 1912, p. 224; and *T. designatus*, Ricardo, Rés. de l'Exp. Scient. Néerland. à la Nouvelle-Guinée, vol. ix., Zool., livr. 3, p. 390, 1913).—The name *lineatus* is preoccupied by *Tabanus lineatus*, Fabr. (1781) (= *T. giganteus*, Deg.).

"*Tabanus pseudoardens*, n. sp." (p. 66, pl. xiv. fig. 18).—As shown by two ♀ ♀ of this species kindly forwarded by Mr. Taylor, the dorsum of the abdomen is *mummy-brown* (dark brown at the distal extremity), not "clove-brown," as stated in the description; the first four ventral scutes are *fawn-coloured*, not "clove-brown"; and the wings in the two specimens received have a well-marked brownish (not "creamy") tinge.

"*Tabanus tetralineatus*, n. sp." (p. 68, pl. xiv. fig. 20), = *T. cinerescens*, MacLeay (King's 'Narrative of a Survey of the Intertropical and Western Coasts of Australia,' vol. ii. p. 467, 1826).—The name *Tabanus cinerescens* and its author have hitherto been somewhat unfairly treated, Wiedemann and subsequent writers, including Kertész ('Catalogus Dipteriorum,' vol. iii. p. 234, 1908), having written *cinerascens* instead of *cinerescens*, and attributed the designation to King instead of to MacLeay. The title-page of the volume in which the description was published bears the date 1827; the present writer is, however, informed by Mr. C. Davies

Sherborn (author of 'Index Animalium') that the work was actually issued on April 18th, 1826.

"*Tabanus parvus*, n. sp." (p. 69).—In size and general appearance, as also in the width of the *front*, this small species closely resembles *T. anellosus*, Summers (Ann. & Mag. Nat. Hist. ser. 8, vol. x., Aug. 1912, p. 226), the typical series of which was also taken at Port Darwin by Dr. C. L. Strangman, the discoverer of *Tabanus parvus* at the same place. The latter species can, however, be distinguished from *T. anellosus* by the expanded portion of the third joint of the antenna being shorter and deeper, by the terminal annuli of the same joint being tawny-ochraceous like the rest of the joint, instead of dark brown, by the existence of a long appendix to the anterior branch of the third longitudinal vein, and by all coxæ, femora, and tibiæ being ochraceous-buff, whereas in *T. anellosus* the coxæ are grey, all the femora greyish clove-brown, and the front tibiæ clove-brown except at the base. Judging from an examination of the paratype of *T. parvus* kindly presented to the National Collection by Mr. Taylor, the description of the coxæ, femora, and tibiæ of this species as "clove-brown" is extremely misleading.

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XXVIII.—*Report on the Annelida Polychæta collected in the North Sea and adjacent parts by the Scotch Fishery Board Vessel 'Goldseeker.'*—Part II. Nephthydidæ to Hesionidæ. By JAMES W. PRYDE, M.A., Walker Trust Research Scholar, Gatty Marine Laboratory, St. Andrews.

[Plate XI.]

THE following report, which includes the Nephthydidæ, Phyllodocidæ, and Hesionidæ, is a continuation of that begun by Mr. William Small, M.A., B.Sc., in 1912 (Ann. & Mag. Nat. Hist. (8) vol. x. p. 165, 1912).

The Nephthydidæ are well represented, and out of the ten species accounted British by Prof. McIntosh, six have been found to be present in the North Sea. The Phyllodocidæ are but sparsely represented by a single species, while the Hesionidæ show representatives of two genera out of the four that are British. They occur in numerous hauls at various depths and at various stations ranging from shallow water

to 10 fathoms. For the only representative of the Phyllo-docidæ no depth can be given, as the label belonging to the tube has been lost, probably in the disastrous fire which took place in the laboratory in June 1913, when much valuable material was lost. 24 fathoms is the greatest depth at which Hesionidæ were obtained, although they were found in numerous hauls.

No lists of synonyms have been given, but they can be obtained from Prof. McIntosh's Monograph (vol. ii. part i., 1908) under the heads of the various species, and they occupy a considerable amount of space.

The specimens examined were part of the collection kindly handed over to Mr. Small by Prof. D'Arcy W. Thomson. I have to thank Prof. McIntosh for giving me from his own collection a typical series of slides of each group.

### Family Nephthydidæ.

Genus NEPHTHYS, Cuvier, 1817.

*Nephthys cæca*, O. F. Müller, 1776.

This species was found in many hauls, and only in one (haul 11191, at Station 18 A) were there not more than one brought to the surface. In haul 187 forty-two were obtained at a depth between 545 and 788 m. This abundance agrees, as far as the North Sea is concerned, with the statement in the Monograph (1908, vol. ii. part i. p. 10), which says that this annelid is common everywhere around the shores of Britain.

Many of the specimens are small, but some are of moderate size. In many cases the lamellæ of the feet were destroyed by being scorched by the fire, while the specimens themselves were rendered hard and brittle. On the feet of those which remained unhurt were found several thecate Infusoria\* and structures which resembled minute *Loxosomæ*.

The largest specimen had 148 segments, but in some of the smaller ones the segments numbered from 60-80. The body-wall was very muscular, and the oblique muscles were boldly outlined.

The gut was examined, and was found to contain diatoms, mud, sand-particles, and small pieces of what seemed to be animal tissue. No specimen showed an extruded proboscis.

Prof. Izuka† found this annelid in Japanese waters in

\* Cf. 'Challenger' Report on Annelida, pls. xiv. A. and xxiii. A.

† Vide 'Errantiate Polychæta of Japan,' by Prof. A. Izuka.

Mororan Harbour, and Adolf Heinen\* found it at no less than thirteen stations in the North Sea. Station  $58^{\circ} 48' \text{ N.}$ ,  $1^{\circ} 20' \text{ E.}$ , is his most northerly record, while Station  $52^{\circ} 50' \text{ N.}$ ,  $3^{\circ} 20' \text{ E.}$ , is his most southerly. The most northerly record in the 'Goldseeker' expedition is Station 18 A,  $60^{\circ} 57' \text{ N.}$ ,  $5^{\circ} 47' \text{ W.}$  On the other hand, the most southerly point is Station 39 B,  $57^{\circ} 59' \text{ N.}$ ,  $0^{\circ} 57' \text{ E.}$

*Nephtys hombergii*, Lamarck, 1818.

It is stated in the Monograph (vol. ii. part i. p. 19) that this annelid is found from Shetland to the Channel Islands, along both shores, and occurring alike in the tidal region and in deep water; but only six are found in this collection, three being obtained at a depth of 10 fathoms at Olliberry, Shetland. They were dredged along with *Notophyllum foliosum*, Sars, and *Harmothoe imbricata*, Linn. In the 'Porcupine' expedition of 1896 this species was dredged at a depth of 96 fathoms.

The largest specimen had 89 segments, but a specimen having 130 segments is mentioned in the Monograph, while Heinen adds: "Audouin und Milne-Edwards geben für die grössten Tiere sogar 200 Segmente an." The body has similar proportions to that of *N. caeca*, but is considerably less. The colour has faded, however, owing to immersion in spirit, but fresh specimens have an iridescent pinkish body, bluish white along the median line dorsally and whitish laterally, with bright red branchiæ along the sides †.

The foot differs from that of *N. caeca*, for the dorsal lamella is smaller, while the ventral lamella is more ovoid than pointed. The most diagnostic feature is the presence of a prominent papilla below the point of the spine in *N. hombergii*. The gut contained diatoms and small crustacean larvæ. From the Reports on the 'Errantiate Polychæta of Japan,' a country in almost the same latitude as our own, there is no mention of *N. hombergii*, nor is it recorded in the 'Challenger' Reports.

*Nephtys hombergii*, var. *kersivalensis*, M'Intosh.

In haul 187 two specimens of this annelid were obtained at a depth of 545–788 m. It differs from *N. hombergii*, Lamarck, in having the ventral lamella in the anterior third

\* Vide 'Die Nephtydeen und Lycorideen der Nord- und Ostsee,' by Adolf Heinen.

† See 'Monograph,' vol. ii. part i. pl. xliii. fig. 3.



much less, and in having a more decided decrease in both posterior lamellæ. This annelid, according to the Monograph, is merely a younger stage in the growth of *N. hombergii*.

From Heinen's Karte 1 *N. hombergii* is seen to have a wide distribution, varying from  $53^{\circ} 52'$  to  $59^{\circ} 9'$  N., and  $1^{\circ} 21'$  to almost  $8^{\circ}$  E. From the 'Goldseeker' collection, however, this annelid is confined to the neighbourhood of the Shetland Isles.

*Nephtys incisa*, Malmgren, 1865.

Haul 8215 alone contained this annelid, when eight specimens were obtained. The animals were small, the largest numbering about 50 segments. The haul was made at Station 8,  $61^{\circ} 35'$  N.,  $0^{\circ} 21'$  E., but the depth at which they were obtained is not given. In the 'Porcupine' Expedition, 1869, this annelid was found from 6–80 fathoms. In one the proboscis was extruded and showed twenty-two rows of minute papillæ; but the short median cirrus, which, according to Malmgren, occurs in the smooth distal region both dorsally and ventrally, was not seen. On the branchiæ were structures resembling minute *Loxosomæ*, but the parasites were too contracted to make out their structure properly. No specimen was mature, and the gut showed sand and sponge-spicules.

There is no mention of this annelid in the 'Challenger' Reports nor in 'Errantiate Polychæta of Japan,' but Heinen obtained several at various stations in the German North Sea. The most northerly point at which he obtained this annelid was  $57^{\circ} 52'$  N.,  $4^{\circ} 52'$  E.; but the 'Goldseeker' dredged it at Station 8,  $61^{\circ} 35'$  N.,  $0^{\circ} 20'$  E.

*Nephtys ciliata*, O. F. Müller, 1789.

This annelid, from various reports, is common on muddy ground or in sandy mud, but only one specimen is present in the collection. O. F. Müller procured it in the first instance from the Farøe Islands, but it stretches to Greenland and to the eastern Canadian waters, as well as to America. Malmgren records it from Spitzbergen, Scandinavia, and Iceland; Ehlers, both shores of the Atlantic; and Théel gives Kara Sea and Nova Zembla. It is not mentioned in the 'Challenger' Reports, but Prof. Izuka notes it as occurring in Japanese waters. Heinen, too, has no record of it in his North Sea Collection, but remarks, "Alle mir vorliegenden Tiere stammten aus Ostsee und Kattegat."

The present specimen was obtained at Station 18 A, 60° 57' N., 5° 47' W., and at a depth of 384 m. It was taken along with *N. cæca* and some Lumbriconereidæ. The body has about 95 segments, and is slightly tapered anteriorly, more so posteriorly, and ends in a caudal cirrus. The foot\* resembles that of *N. cæca*, but the lamellæ are not so well developed, and so the species can be readily differentiated. The tentacles, moreover, are more slender than those of *N. cæca*, and so another point of difference arises. The gut contained diatoms, mud, and small larvæ, many of which were fragmentary. The specimen was not mature.

*Nephtys cirrosa*, Ehlers, 1868.

Several fragments of this annelid were dredged at Station 7, 61° 06' N., 2° 1' E., at a depth of 15 fathoms, and all the fragments denote that the entire annelids were small. There is no mention of *N. cirrosa* in the 'Challenger' Reports. Izuka records none from Japanese waters, and Heinen makes no mention of any from his North Sea investigations. The Ray Society Monograph, however, gives the following as its habitat:—Channel Islands, Herm, Guernsey, and in sand under stones in Galway, Ireland (*M'Intosh*); shores of France, Dinard and Croisic (*Baron de St. Joseph*); Norway (*Canon Norman*); Strait of Magellan (*Ehlers*).

There was nothing of outstanding interest about any of the fragments, and none showed any signs of maturity.

*Nephtys grubei*, M'Intosh, 1900.

Only one specimen of this annelid was obtained. It occurred in haul 187 and was trawled at the depth of 545–788 m. In the Monograph (vol. ii. part i. p. 33) this creature was found at a depth of 540 fathoms in the 'Knight Errant' Expedition. No record of it occurs in Prof. Izuka's work nor in 'Challenger' Reports. The specimen is very small and very much shrivelled, having been badly scorched in the fire. Identification was made from the structure of the feet and the bristles.

Family Phyllodocidæ.

Genus NOTOPHYLLUM, Ørsted, 1843.

*Notophyllum foliosum*, Sars, 1835.

The tube containing this specimen, which is the only representative of the Phyllodocidæ, had no label, and conse-

\* Vide 'Monograph,' vol. ii. part i. pl. lxvi. figs. 1 & 9.

quently no depth nor locality can be given. The animal itself is linear, and the body has about 98 segments. The dorsal surface is light brown and slightly iridescent, while the ventral surface is darker in colour, and each segment has minute dark spots. No groove is present in the ventral surface of the specimen, and the dorsal lamellæ of the feet, moreover, were not so prominent as is mentioned in the Monograph. However, it (dorsal lamella) was considerably larger than the ventral lamella, and no spines were seen on the spinigerous papilla at its outer border. The Monograph mentions that the spinigerous papilla may bear a few (about two) smooth tapering bristles, and Malmgren adds that the large, more or less horizontal dorsal cirrus is elliptico-subrectangular or unequally reniform. The ventral bristles spring from the tip of the lobe, and are characteristic of the species.

The Monograph states that this species is more sluggish than the ordinary examples of the Phyllodocidæ, and, when irritated, coils its body in a somewhat stiff manner. There is no mention of this species in the Reports of the 'Challenger' Expedition; but in Prof. Izuka's work *Notophyllum japonicum*, Maren., is described, and this species appears to approach the northern species very closely.

From the Monograph its habitat is given as:—Shetland (*J. G. J.*); Lamlash Bay, Arran (*Dr. Howden*); Bay of Galway, Ireland (*Dr. E. P. Wright*); St. Andrews Bay, deep-sea fishing-boats (*E. M.*); common in dredgings, Plymouth (*Allen*); Norway (*Ersted, Sars, Norman, and Koren*); Sweden; Adriatic (*Sars*); Marseilles (*Marion*).

### Family Hesionidæ.

Genus OPHIODROMUS, Sars, 1861.

*Ophiodromus flexuosus*, Della Chiaje, 1825.

Fifty-eight complete and an infinite number of fragments of this species were obtained in four hauls. The hauls were 8160, 2 miles E.N.E. of Rams Ness, at a depth of 100 m.; 152, off Ardmore Point, at a depth of 180 m.; 8265, at Station 41 A, 56° 48' N., 1° 19' E., at a depth of 94 m.; and 72, 3 miles west of Tarbet Ness, at a depth of 24 fathoms.

This annelid usually inhabits regions where there is grey mud or clay, and off the western coast of Britain has been found at depths varying from 4–125 fathoms. One or two have been found on the verge of extreme low water in Ard-

maddy Bay. It is also found off the shores of Norway (*Sars*) and off the Mediterranean shores of France.

The largest specimen has about 60 segments and is fusiform in shape. The body dilates behind the head, reaches its maximum about the anterior third, and then tapers to the tail. The tail terminates in two moderately long slender cirri, while the dorsum has a lustrous brown colour, which is transversely banded at intervals with belts of fine iridescent blue. In the largest specimen nine such bands were seen, besides several minor streaks which become fainter and fainter posteriorly. When the animal was placed in spirit the colours instantly disappeared, while the animal itself broke up into fragments. The same thing, according to the Monograph, takes place on the immersion of the animal in fresh water or in impure sea-water.

Many specimens show an extruded proboscis, which is proportionately large, but is devoid of papillæ or jaws. In the extruded condition the proboscis is cylindrical, but in some there was a swollen basal region. The buccal opening is capable of great dilatation. No specimen showed signs of maturity.

*Ophiodromus flexuosus* does not appear in the 'Challenger' Reports, but an allied form, *Salvatoria kerguelensis*, is referred to. No mention of it is made by Prof. Izuka, of Japan.

#### Genus CASTALIA, Savigny, 1820.

##### *Castalia fusca*, Johnston, 1836.

This annelid was obtained in dredge 7 at a depth of 15 fathoms. In all there are five complete specimens and six fragments. The specimens are very small, the largest only measuring  $\frac{3}{4}$  inch. They usually are found in much shallower water, for they occur between tide-marks at various points around the British shores. In Shetland they are common in the roots of tangles in the Laminarian region. Keferstein obtained this species at St. Vaast, Normandy, Claparède at Naples, Carus in the Mediterranean, and Marion at Marseilles; but there is no word of it in the Reports of the 'Challenger' Expedition nor in the 'Errantiate Polychæta of Japan.'

The specimens are reddish brown and have a well-marked dark line down the dorsum. This line is the dorsal blood-vessel. The segments number about 50, slightly narrowed in front, and then they narrow more and more towards the tail-region, which terminates in two slender cirri. One specimen had a short, cylindrical, and somewhat massive

proboscis, but the filiform papillæ at the aperture were not present. The organ is well adapted for the predatory habits of the animal, and Dr. Johnston found that they devoured one another in confinement.

The Monograph mentions that Dr. Johnston considered the purplish hue, which is often seen in many specimens, spread rapidly all over the body when the animal is alarmed. However, it is further stated that, as this phenomenon occurred in April, it is possible that it may have been connected with the development of the ova. Sir J. Dalyell, in his experiments, found that the colour depended on the food.

Genus <sup>r</sup>MEGALIA, Marion & Bobretsky, 1875.

<sup>a</sup>*Mégalia assimilis*, sp. n.

One fragment of this annelid, consisting of the head and seventeen segments, was taken in dredge 104 at the depth of 75 m. at Station 41 B, lat. 56° 42' N., long. 0° 35' E. In the Monograph an allied species, *M. perarmata* (Marion & Bobretsky), is not uncommon in dredgings from Queen's Ground, Asia Shore, and Milbay Channel, Plymouth. Marion and Bobretsky found it under stones and in prairies of *Posidonia*, and in the coralline region, Marseilles.

*Head* somewhat quadrangular, with four eyes of considerable size, the anterior pair being the larger and placed somewhat widely apart. The pairs are situated near each other towards the middle region. In *M. perarmata*, according to Marion and Bobretsky \*, the anterior pair have lenses, but in this species there is some uncertainty. The tentacles are long and smooth, curved in this specimen, and are attached over the palps, which are smooth, stout, and biarticulate. The buccal region lies beneath the head. Six pairs of articulated tentacular cirri, most of which in this specimen have been broken, are directed forward, and each has a spine at its base.

*Body* about 5 mm. in length (7-8 mm. in *M. perarmata*), and tapers posteriorly. The anal segment is absent. The colour is yellow, but brown spots are prominent at the base of each dorsal cirrus and brown patches appear on the head. Transverse striations occur on the dorsal surface at the bases of the feet, up several of which the striæ are continued. The ventral surface is lighter in hue, and on it also are minutely transverse and somewhat irregular striæ. The Monograph (vol. ii. part i. p. 137) states in reference to *M. perarmata* :

\* *Vide* 'Annales des Sciences Naturelles,' sér. vi. vol. ii. pl. vii. fig. 16.

"The dorsal surface of the segments shows under the microscope transverse striæ, somewhat irregularly arranged." The proboscis is not extruded, so no comparison with *M. perarmata* can be made. The alimentary canal is almost straight and uniform for the first seven setigerous segments, and then it assumes a sacculated appearance posteriorly.

The foot in this specimen resembles that of *M. perarmata* in being uniramous, having the long cirrus dorsally with a spine in the ceratophore, and a very bluntly conical setigerous region, with a small papillæ supported by two fairly stout spines, and carrying a fan-shaped tuft of translucent bristles. The articulations of the cirrus, however, are not so large as, but are more numerous than, those of *M. perarmata*. Most of the bristles have slightly curved shafts, which are striated and have a bevelled appearance at the tip, the distal end of which is somewhat blunt, and in several of those whose terminal pieces are deeply serrated is slightly cleft (see fig. 2). The terminal pieces vary from medium to long. In all the tip is hooked, and a secondary process is present beneath. The tip of the bristles in *M. perarmata*, on the other hand, is not so distinct, for it is only in the shorter forms that the minute structure is distinguishable. The edges of the blades, however, present great differences. In *M. perarmata* the edge is minutely serrated and the serrations are the same for every bristle (see fig. 3); but in this form the serrations are very large and, in several of the larger blades, resemble the deep serrations in the blade of *Castalia fusca* (see figs. 1 & 2). Thus two distinct forms of serration are present.

In many respects the animal agrees with *M. perarmata*, but the distal end of the shafts and the serrations of the blades are so divergent and diagnostic, that one is compelled to consider it as a new species, allied, however, to *M. perarmata*. The specimen is not mature. Moreover, it is an interesting feature that the distribution of the genus has been extended northward, for not a single example of *M. perarmata* has been found, up to date, north of Plymouth.

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## EXPLANATION OF PLATE XI.

- Fig. 1. Bristle (anterior) from fifteenth foot of *Megalia assimilis*. Enlarged.  
 Fig. 2. Bristle (posterior) from the fifteenth foot. Enlarged.  
 Fig. 3. Bristle of *Megalia perarmata*, De St. Jos., after M'Intosh. Enlarged.

## XXIX.—Description of a new Species of Noctuidæ.

By Sir GEORGE F. HAMPSON, Bart., F.Z.S.

*CATOCALINÆ.*

7494 a. *Homæa addisonæ*, sp. n.

Head, thorax, and abdomen reddish brown mixed with blackish and ochreous; palpi with white ring at extremity of second joint; frons with white line below; tegulæ ochreous, with two blackish spots near base and band before tips; pectus and legs ochreous brown and greyish, the tarsi whitish. Fore wing reddish brown mixed with blackish and some grey; an indistinct sinuous ochreous subbasal line from costa to submedian fold; antemedial line indistinct, ochreous, becoming whitish at costa, sinuous and inwardly oblique; the medial area with a paler red-brown band with white marks at costa before, between, and beyond the double inwardly oblique and slightly sinuous black medial line, the outer line rather diffused; reniform with pale reddish centre defined by blackish, on which are three white striæ on its inner side, a small lunulate spot on its outer side at middle, an elongate spot beyond its upper extremity and two beyond its lower; postmedial line ochreous defined on inner side by black forming somewhat lunulate marks in the interspaces, slightly sinuous, excurved to vein 4, then incurved, a dark shade beyond it with dentate outer edge and some white points on costa; a black line before termen defined on inner side by grey except towards costa and slightly dentate at veins 6 to 3; a white line at base of cilia. Hind wing reddish brown mixed with blackish except on inner area, which has a series of black marks on vein 1; an indistinct double dark antemedial line ending at submedian fold; two slight elongate white spots beyond lower angle of cell, the lower minute; an indistinct double curved sinuous dark postmedial line

ending at submedian fold and with dentate black marks beyond it in the interspaces between veins 6 and 2; a black line before termen defined on inner side by grey, slightly waved at the veins; a white line at base of cilia. Under-side grey irrorated with brown; both wings with indistinct double curved and slightly waved dark postmedial line, and series of blackish striae before termen.

*Hab.* SIERRA LEONE, Kennama Distr. (*Mrs. M. Addison*), 1 ♂ type, cotypes ♀ in Mus. Oxon. *Exp.* 40 mm.

## BIBLIOGRAPHICAL NOTICE.

*An Account of the Crustacea Stomatopoda of the Indo-Pacific Region, based on the Collection in the Indian Museum.* By STANLEY KEMP. Memoirs of the Indian Museum, Vol. IV. No. 1: with which are issued Illustrations of the Zoology of the R.I.M.S.S. 'Investigator' ... Crustacea Stomatopoda, Pls. I.-X. Calcutta, 1913. Price 15 rupees.

THIS Monograph of the Indo-Pacific Stomatopoda is based on a study of what is doubtless the richest collection of these Crustacea that has ever been brought together. The examination of the material seems to have been very thorough, the abundant literature of the subject has been carefully explored, and the results are presented in a way that lacks nothing of clearness or methodical arrangement. More than two-thirds of the total number of known species and varieties are found within the limits of the Indo-Pacific region, and of the great majority of these the author has examined specimens and, in many cases, types. He records the material assistance derived from a collection sent to him on loan by permission of the Trustees of the British Museum. It may be added that the National Collection has benefited, not only by his revision of these specimens, but also by a fine series of co-types of his new species received in return from the Indian Museum.

Among the many points of more general interest that are dealt with in the course of the Memoir, attention may be called to the discussion (pp. 150 *et seq.*) of the perplexing variations of *Gonodactylus chiragra* and its allies. It is pointed out that the range of variation is much greater among immature than among adult specimens, and a comparison is made with the analogous case described by Gadow in the turtle, *Thalassochelys caretta*.

The names of Wood-Mason, Alcock, and Annandale remind the student of Crustacea that the Indian Museum, Calcutta, has long been one of the leading centres of carcinological research. Mr. Kemp had already won his spurs in this field of work before he went to India, and the fine Monograph which he has now produced is worthy of the high traditions of the institution with which he is connected.

W. T. C.



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## MAGAZINE OF NATURAL HISTORY.

[EIGHTH SERIES.]

No. 75. MARCH 1914.

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XXX.—*Descriptions and Records of Bees.*—LVII.  
By T. D. A. COCKERELL, University of Colorado.

### *Mesotrichia bakeriana*, sp. n.

♀.—Length about 20 mm., anterior wing  $18\frac{1}{2}$ .

Robust, black, with black hair, that on face inconspicuously mixed with greyish white, that on cheeks wholly black except a few pale hairs behind lower part of eyes. Wings very dark fuliginous, with golden-green and purple tints. Very close to *M. amauroptera* (*Xylocopa amauroptera*, Pérez), but differing in the venation, the lower side of the second s.m. being much more than twice as long as the upper and little shorter than the lower side of the first. Also, the tibial scale or process (large in *amauroptera*) is poorly developed, a slender carina ending in an inconspicuous lamina. The tarsi are not reddish brown apically as in *amauroptera*, and the hair on their inner side is wholly black.

Compared with *M. bombiformis* (*Xylocopa bombiformis*, Sm.) our insect is distinguished by the well-punctured cheeks and the extremely dark wings.

*Hab.* Los Banos, Philippine Is. (C. F. Baker, 1786).

### *Nomia nevadensis*, Cresson.

Grossmont, near San Diego, California (C. H. Richardson).

### *Triepeolus cressonii*, Robertson.

Quanah, Indian Territory, on *Helianthus*, June 10, 1906 (J. D. Mitchell).

*Ann. & Mag. N. Hist.* Ser. 8. Vol. xiii. 19

*Crocisa calceata*, Vachal.

Grangezicht, S. Africa, Nov. 30, 1907 (C. K. Brain).

This agrees exactly with one collected by Dr. Brauns at Bothaville, Orange Free State, March 10, 1899.

*Dianthidium ehrhorni* (Cockerell).

Grossmont, near San Diego, California (C. H. Richardson).

*Dianthidium tegwaniense*, sp. n.

♀.—Length about 7 mm.

Robust, black, marked with lemon-yellow; pubescence scanty, white, ventral scopa glittering creamy white; labrum and mandibles black, mandibles with strong deep oval punctures; clypeus yellow, with the lower margin black, minutely nodulose; a black sutural band extends over upper margin of clypeus and halfway down sides, and connects with a broad, rather bottle-shaped, median black band which divides the supraclypeal yellow into two halves; otherwise the supraclypeal area, as well as sides of face, yellow up to level of antennæ, and the lateral face-marks extending upwards as narrowing bands, which end in a point on orbital margin above middle of front; flagellum rufo-piceous beneath; head and thorax above very densely and strongly punctured; scutellum with a projecting edge, obtusely emarginate; the angular tubercles marked with yellow and a light yellow mark beneath and behind wings, but thorax otherwise black; tegulæ piceous, with a broad light reddish margin, and a yellow spot in front. Wings strongly dusky, b. n. meeting t.-m., second r. n. going beyond second s.m. Legs black at base, but femora otherwise red, the anterior and middle ones with a broad yellow band beneath; tibiæ and basitarsi yellow on outer side, ferruginous on inner, the hind tibiæ clouded with dusky within; hind basitarsi very broad; small joints of tarsi ferruginous; first three abdominal segments black, with broad yellow widely interrupted bands, confined to the lateral thirds or less; band on fourth segment narrowly interrupted; fifth segment yellow except the ferruginous hind margin, sixth segment yellow; venter (beneath the scopa) ferruginous, with narrow dark bands.

*Hab.* Tegwani, S. Africa, Jan. 5, 1909 (C. K. Brain).

In Friese's table of *Anthidium* ('Die Bienen Afrikas') this runs close to *A. cordatum* and *A. truncatum*, but is easily distinguished by the markings. *D. tegwaniense* belongs to the subgenus *Anthidiellum*.

*Megachile lachesis nigrolateralis*, subsp. n.

♂.—Agrees with *M. lachesis*, Sm., from Bismarck Archipelago, except as follows:—Hair of sides of face wholly black, but light between antennæ; wings paler, especially the basal two-thirds. It is much smaller than *M. atrata*, Sm.

*Hab.* Los Banos, Philippine Is., 2 ♂ (*Baker*, 1789).

*Panurginus crawfordi*, sp. n.

♂.—Length about 7 mm.

Black, the clypeus (but no lateral face-marks) pale primrose-yellow; anterior tibiæ yellow in front, their tarsi reddish yellow; middle tarsi pale dull reddish, hind tarsi dark; antennæ black; first r. n. joining first s. m. near end.

This has almost exactly the characters of *P. herzi*, Mor., from Siberia, closely resembling *P. montanus*, but differing by the very delicately punctured clypeus, the darker hind legs, the hind basitarsus slender, with the three following joints cordiform, and the sixth ventral segment without hair-patches. *P. herzi*, however, has the abdomen opaque or nearly so, in the manner of *montanus*, while the Japanese species has it brilliantly shining. The mesothorax of our species is very shiny, with widely scattered extremely minute punctures, while in *montanus* it is duller; the antennæ are longer than in *montanus*, and the stigma is darker.

*Hab.* Harima, Japan, April 1912 (*Fukai*). U.S. National Museum.

The *P. montanus* compared was collected by Friese at Airolo, June 29, 1884. This is the first *Panurginus* from Japan. Mr. J. C. Crawford, in transmitting it to me, expressed the opinion that it was new.

*Andrena fukaii*, sp. n.

♀.—Length about 12½ mm.

Robust, black, the head and thorax with ochraceous hair; head very broad, facial quadrangle much broader than long; front of head with much dull pale brownish-tinted hair, more distinctly fuscous on front and sides of face, quite dark about ocelli, but pale on occiput; mandibles ordinary, red at extreme tip and with a red basal tubercle; malar space short, more than twice as broad as long; process of labrum low, rather narrowly truncate; clypeus very strongly and confluent punctured; facial foveæ moderately broad, seal-brown, not much separated from eye below, where they end

considerably below level of antennæ ; antennæ wholly dark, third joint longer than next two combined, but not quite as long as next three ; hair of thorax above erect, rather bright ochreous ; mesothorax shining, with very strong punctures, which are sparse on disc posteriorly ; pleura very densely punctured ; area of metathorax triangular, covered with exceedingly large and coarse vermiform rugæ ; tegulæ dark red. Wings hyaline, slightly dusky ; nervures ferruginous ; stigma of moderate size, dark red ; b.n. meeting t.-m. ; second s.m. quadrate, receiving first r.n. a little beyond middle. Legs black, ordinary ; spurs light ferruginous, hind spurs strongly curved ; hair of legs mostly pale, but light fulvous or orange-fulvous on inner side of tarsi, middle tibiæ with fuscous hair on outer side, tuft of hair on hind knees dark reddish fuscous ; hind tibial scopa creamy white, fuscous above basally. Abdomen shining black, well but not closely punctured, the punctures on first segment large, on the others small ; segments with a deep transverse subapical sulcus and the apical margins distinctly elevated ; surface of abdomen thinly covered with pale hair (long on first segment) ; hind margins of second to fourth segments with narrow greyish-white hair-bands, only noticeable at sides on second and third, but entire on fourth ; apical fimbria dark reddish fuscous.

*Hab.* Harima, Japan, April 15, 1912 (*Fukai*). U.S. National Museum.

Related to *A. mitsukurii*, Ckll., but distinguished by the paler wings, b.n. meeting t.-m., &c. Only the male of *mitsukurii* is known, but *A. fukaii* is too different to be its female.

In Schmiedeknecht's table of European species it runs to 137, and is then doubtful, because the red tubercle at base of mandibles is fairly well developed ; it is, however, not like *A. insolita*. Run beyond, it goes to 191, and is then again doubtful, because the scopa is fuscous at base ; but run on to 193 it falls closest to *A. dissidens*, which is quite different. It is quite unlike any European or Asiatic species in my collection.

*Ctenoplectra vagans*, Cockerell.

This was described from the male. Professor Baker sends a female collected on Mt. Makiling, Luzon. It has degenerate lateral ocelli, as in the male, which will readily separate it from *C. chalybea*. The mesothorax and scutellum are minutely rugose, with scattered very feeble punctures. The



apical part of the abdomen beneath is covered with dark ferruginous hair. There are no dentiform processes on the labrum.

*Xylocopa virginica* (Drury).

Garrison, N.Y., 2 ♂ (*Eleth Cattell*).

*Anthophora ursina*, Cresson.

Garrison, N.Y., 2 ♀ (*Eleth Cattell*).

*Anthophora marginata*, Smith.

Rito de los Frioles, New Mexico, August (*Cockerell*).

*Anthophora vestita*, Smith.

Rosebank Experiment Station, S. Africa, Dec. 9, 1909, 2 ♀ (*C. K. Brain*).

*Anthophora rufolanata*, Dours.

Millefs Pt., S. Africa, Nov. 27, 1910, in holes in bank (*C. K. Brain*).

The two females before me agree perfectly with Dours's description, except that when extended they are fully 12 mm. long, and the wings are distinctly dusky. The species is closely allied to *A. vestita*, but quite distinct.

*Anthophora fallax*, Smith.

Devil's Peak, S. Africa, Dec. 1, 1907, 1 ♂ (*C. K. Brain*).

Very close to *A. circulata*, but, I think, distinct. The flagellum is entirely black. Is not *A. circulata*, var. *obscuriceps*, Fr., the same thing?

*Anthophora griseovestita*, sp. n.

♂.—Length about or nearly 10 mm.

Black, with abundant light greyish-ochreous hair above, black below; hair of vertex black, but of front and occiput light; hair of thorax above strongly mixed with black; eyes light reddish; clypeus (except rather broad black lateral borders, with a lobe-like extension inwards near upper end), a very minute supraclypeal mark, lateral marks filling space between clypeus and eye (but deeply excavated above), labrum (except a spot at each basal corner and four small dentiform tubercles on apical margin), large spot on base of

mandibles, and broad stripe on scape all yellow; flagellum black, very obscurely reddish beneath; third antennal joint about as long as next two combined; tegulæ rufo-testaceous. Wings dusky, nervures dark fuscous; b.n. falling a little short of t.-m.; third s.m. as broad above as below. Hair of legs like that on body, but orange-fulvous on inner side of tarsi, and middle tarsi with a broad brush of black hair on each side of last joint, the whole shaped like a peacock's feather. Hair of abdomen rather dense, coloured like that of rest of insect, but hind margins of segments with dense pallid (not white) hair-bands, the segments of apical half with some black hair between the bands; venter reddish.

*Hab.* Rosebank, S. Africa, on flowers, Dec. 9, 1909 (*C. K. Brain*).

Related to *A. schultzei*, Friese, but smaller, second s.m. much narrower above, t.-m. falling short of b.n. (going basad of it in *schultzei*), &c. Also related to *A. braunsiana*, Friese, but smaller, black brush on middle tarsus broader, clypeus with less black, sides of thorax without red hair, &c. Also related to *A. vestita*, but somewhat smaller, without red or fulvous hair; abdomen distinctly banded, clypeus with more black, tegulæ much paler. According to Friese's tables the abdomen of *vestita* is without black hair, but in reality the fifth and sixth segments have some black hairs, inconspicuous and nearly hidden by the segments in front.

*Anthophora imitatrix*, Pérez (litt., Nov. 1911).

*Anthophora soror*, Pérez, 1910 (Syria and Russia).—Not *A. soror*, Pér., 1905 (Japan).

*Tetralonia rupicola*, sp. n.

♀.—Length  $10\frac{1}{2}$  mm., width of abdomen scarcely  $4\frac{1}{2}$ .

Black, the small joints of tarsi (but not the basitarsi) ferruginous; head very broad, facial quadrangle broader than long; no yellow or white markings, but lower edge of clypeus obscure reddish; mandibles with a reddish mark near middle; labrum densely covered with ochreous hair; clypeus very densely punctured; hair of head long, white, slightly ochreous behind ocelli; mesothorax dull and rough in front, but on the posterior middle brilliantly shining, with sparse strong punctures; scutellum shining, with small punctures; hair of thorax above light ochreous, at sides and beneath white; tegulæ clear rufo-testaceous. Wings greyish

hyaline, not milky; nervures dark rufo-fuscescent; b. n. falling short of t.-m.; femora with white hair, that of tibiae and tarsi distinctly yellowish, though very pale; light reddish hair on outer side of middle tibiae; hair on inner side of middle and hind tarsi bright ferruginous; spurs cream-colour. Abdomen rather elongate; hind margins of segments testaceous; first segment with long white hair on basal part; segments 2 to 4 with creamy-white tomentum at base, then a broad black zone (finely punctured and having sparse black hair), and on the apical margin a band of dull white tomentum; fifth segment covered with ochreous tomentum, clear ferruginous on apical middle; sixth with red hair; venter with long pale hair; second ventral segment with a modified basal area, strongly bilobed and finely transversely striate.

*Hab.* Rosebank Experiment Station, S. Africa, on flowers, Dec. 9, 1909, 4 ♀ (*C. K. Brain*).

Closely related to *T. minuticornis*, Friese, but smaller in every way. Also allied apparently to *T. kobrowi*, Friese, but without any pale band on clypeus, which I infer to exist in *kobrowi* from Friese's comparison with *T. dentata*. *T. rupicola* does not especially resemble *T. dentata*, and it would not occur to me to make comparison with that species. Friese says that the mandibles of *kobrowi* are reddish yellow apically, which is not true of *rupicola*. The flagellum of *rupicola* is dark reddish above (black in *kobrowi*) and paler but dull red beneath, the third joint is a little shorter than the next two together. The tarsi of *kobrowi* are red, whereas only the small joints are red in *rupicola*.

The maxillary palpi of *T. rupicola* are short, with the two apical joints small, sometimes looking like one.

*Tetralonia dilecta* (Cresson).

Bloomington, Indiana, May 16, 1 ♂ (*Max Ellis*).

This species ranges unchanged west to Colorado.

*Tetralonia robertsoni*, sp. n.

♀.—Length about or nearly 15 mm.

Black, robust; clypeus entirely black, strongly punctured; third antennal joint a very little longer than the next two together; hair of head, thorax, and basal segment of abdomen very pale ochreous; hair of rest of abdomen black, reddish black at sides of apex; anterior femora with whitish hair, middle femora with a patch of reddish hair beneath at

base, hind femora with mostly pale hair, the apical tuft dusky reddish; tibiae and tarsi with fuscous hair, a conspicuous ochreous patch at apex of anterior ones in front, hair on outer side of middle tibia shining mouse-colour in certain lights, scopa of hind legs black. Wings strongly brownish, first r. n. joining second s.m. more than a third from its apex; apical half of second abdominal segment with distinct though fine punctures.

*Hab.* Washington, D.C. (type locality), May 15 (*Cockerell*); Garrison, N.Y. (*Eleth Cattell*).

This is evidently *Synhalonia atriventris fuscipes*, Robertson, but the name is not available because of *Tetralonia fuscipes*, Morawitz. It is possible, but I now think not probable, that *T. illinoensis* (Rob.) is its male; should this prove to be the case, the name *illinoensis* will have to be used.

*Tetralonia cordleyi orophila*, subsp. n.

♀.—Like *T. cordleyi*, but with abdominal bands broader, that on second segment about as broad at the sides as in the middle; bands on second and third segments each with a small median projection on upper (basal) side.

*Hab.* Boulder, Colorado, June 29 (*T. D. A. Cockerell*).

*Tetralonia chrysophila*, sp. n.

♀.—Like *T. aragalli*, but differing as follows: no distinct smooth area on upper part of clypeus; hair of thorax cream-colour, not fulvous; second s.m. larger; apical plate of abdomen less broadened basally, less triangular; abdominal bands much whiter; fifth segment dark reddish fuscous in middle, white at sides.

*Hab.* Las Vegas, New Mexico, at flowers of *Ribes aureum*, May 9 (*T. D. A. Cockerell*).

I have had this for many years, labelled as a variety of *T. frater* (Cress.).

The following key will serve for the separation of *Tetralonia* females related to *T. chrysophila* and *orophila*:—

- |   |                          |
|---|--------------------------|
| Hind spurs hooked at end; basal half of second abdominal segment covered with greyish-white tomentum, but fuscous tomentum at extreme base, normally covered by first segment ..... | <i>dilecta</i> (Cress.). |
| Hind spurs not hooked .....   | 1.                       |
| 1. Fourth abdominal segment entirely covered with black hair .....  | <i>lycii</i> (Ckll.).    |

- Fourth abdominal segment with some or much pale hair ..... 2.
2. Abdominal bands rather inconspicuous; bands on third and fourth segments narrow, thin or broken in middle..... *truttæ* (Ckll.).
- Abdominal bands broad and very conspicuous ..... 3.
3. Hair on inner side of hind basitarsi very dark fuscous or brownish black ..... *intrudens* (Cr.).
- Hair on inner side of hind basitarsi clear ferruginous..... 4.
4. Second abdominal segment entirely beset with pale hair, except the narrow apical margin, and sometimes black hair at extreme base, normally covered by first segment ..... 5.
- Second abdominal segment not entirely beset with black hair, the band conspicuously narrowed at base (laterally) or at apex (in middle), or the whole band narrowed ..... 8.
5. Pale hair of second segment dense all over..... 6.
- Pale hair of second segment thin on basal part, with a dense white band on apical part..... 7.
6. Clypeus with a strong median smooth ridge ..... *phaceliæ*, Ckll.
- Clypeus without such a ridge ..... *douglasiana*, Ckll.
7. Tegulæ dark rufo-piceous ..... *virgata* (Ckll.).
- Tegulæ clear amber-colour..... *fowleri* (Ckll.).
8. Hair on fifth abdominal segment purplish black, white only on extreme lateral margins; basal half of second segment black at sides ..... 9.
- Hair on fifth abdominal segment broadly white or pale ochreous laterally, at least on apical half ..... 10.
9. Band on second abdominal segment only about half as broad sublaterally as in middle; upper margins of bands of second and third segments concave laterally.... *cordleyi* (Vier.).
- Band on second abdominal segment as broad sublaterally as in middle; upper margins of bands on second and third segments scarcely concave laterally .... *cordleyi orophila*, Ckll.
10. Larger; anterior wing  $12\frac{1}{2}$  mm. long; tegulæ amber-colour..... *speciosa* (Cress.).
- Smaller; anterior wing less than 11 mm. long ..... 11.
11. Band on second segment relatively narrow, more than basal half of segment black at sides; upper edge of band straight; bands snow-white; clypeus very coarsely and confluent punctured ..... *belfragei* (Cress.).

- Band on second segment not thus narrowed ;  
when (*chrysobotryæ*) second segment is  
rather broadly black right across basally,  
bands creamy white, and clypeus less  
coarsely punctured ..... 12.
12. Hair on thorax above white; bands not  
yellowish-tinted; band on fourth segment  
not angulate in basal middle; clypeus  
with longitudinal ridges, between which  
are punctures..... *annæ*, Ckll.
- Hair on thorax above pale ochreous, cream-  
colour, or fulvous; clypeus without such  
distinct ridges ..... 13.
13. Band on second abdominal segment about  
twice as broad at sides as in middle; band  
on fourth segment angulate in apical  
middle..... 14.
- Band on second abdominal segment about  
as broad at sides as in middle, except at  
extreme lateral margins; bands on third  
and fourth segments narrower and much  
whiter than in *chrysophila* ..... *chrysobotryæ*, Ckll.
14. Second s.m. receiving first r. n. before  
beginning of its last third; abdominal  
bands very pale ochreous, that on second  
segment invaded by a lobe of black at  
sides basally ..... *aragalli* (Ckll.).
- Second s.m. receiving first r. n. beyond  
beginning of its last third; abdominal  
bands greyish white, that on second seg-  
ment not invaded by a lobe of black at  
sides basally ..... *chrysophila*, Ckll.

*Melissodes suffusa*, Cresson.

Falfurrias, Texas, May 18, 1907, on *Helianthus*, 2 ♂  
(*A. C. Morgan*).

*Melissodes humilior*, Cockerell.

Rito de los Frijoles, New Mexico, Aug., 1 ♀ (*T. D. A.*  
*Cockerell*).

*Xenoglossa pruinosa* (Say).

Santa Fé, New Mexico, Aug. 2 (*T. D. A. Cockerell*).

XXXI.—*Brief Descriptions of new Thysanoptera*.—III. By RICHARD S. BAGNALL, F.L.S., F.E.S. (Hope Department of Zoology, University Museum, Oxford).

Suborder TEREBRANTIA.

Family *Ælothripidæ*.

*Orothrips australis*, sp. n.

Colour dark grey-brown; hind legs, including tarsus, unicolorous with body (other legs absent in the type specimen). Mouth-cone rather long; reaching across prosternum; maxillary palpus 7-jointed; labial 3 (?) -jointed. Antennæ dark grey-brown, apex of joint 2 and whole of 3 excepting distal third yellowish-white, extreme base of 4 yellowish-brown; relative lengths of joints approximately:—32 : 60 : 104 : 82 : 52 : 32 : 19 : 12 — joint 3 pedicellate. Very narrow, wavy, elongated, membranous sense-areas in 3 and 4; a short, straight, but otherwise similar area in 4; and a minute sense-cone on each of the joints 5, 6, and 7.

Fore-wings longer and narrower than in *kelloggii*, Moulton, clear white with extreme base and a band across tip dark brown, and a similar but more extensive dark band across middle; setæ along costa and the longitudinal veins minute; cilia of hind fringe up to more than 2·5 times as long as the greatest breadth of wing. All cross-veins included well within the central dark area. Hind-wings with light grey patches corresponding with the dark areas of fore-wings.

Abdominal segment 8 without the pair of stout spines described in *kelloggii*, 9 and 10 with moderately long bristles; tergite 9 about twice as long as 10.

Differs from *O. kelloggii*, Moulton, in the colour and relative lengths of the antennal joints, the longer mouth-cone, and fewer (?) joints in labial palpi; the longer, narrower fore-wings with more extensive dark central area, more minute setæ, and longer cilia; and the lightly banded hind wings.

Moulton says that the labial palpi of *O. kelloggii* are 4-jointed in his key to genera, but 5-jointed in describing the genus and species.

*Type*. In Hope Collections, University Museum, Oxford.

*Hab*. AUSTRALIA: one ♀ collected by Mr. A. Eland Shaw from the flowers of a native shrub, *Xanthorrhœa australis*, Healesville, Victoria, Oct. 12, 1913.

Family *Thripidæ*.*Thrips japonicus*, sp. n.

A very distinct species.

♀.—Length about 1·4, breadth of mesothorax 0·3 mm.

Colour yellow, lightly tinged with grey, legs lighter and thorax orange-yellow; setæ dark. Abdominal segments 9 and 10 entirely dark grey-brown, almost black, and all *tergites* lighter or darker grey-brown. Antennal joints 1 and 3 dirty yellowish-white, 2 orange-yellow, 4–7 dark grey-brown, 5 in some specimens more or less yellowish basally. Fore-wings and cilia grey, lighter basally.

Head about 0·75 as long as broad and 0·8 as long as the prothorax; eyes coarsely faceted, pilose, black. Relative lengths of antennal joints 2–7 as follows:—24 : 34 : 32 : 22 : 31 : 7 — 3 pedicellate, and 3 and 4 fusiform.

Prothorax about 1·5 times as broad as long, surface sparsely setose; bristles at posterior angles about 0·4 the length of prothorax. Wings reaching to about the ninth abdominal segment, upper vein of fore-wing with 3 (approximately 1+1+1) setæ in the distal half.

Abdomen elongated, no broader than pterothorax, with segments 9 and 10 sharply narrowed to tip; 10 divided above.

*Type*. In Hope Collections, University Museum, Oxford.

*Hab*. Kobe, Japan, not uncommon, Nov. 1913 (*J. E. A. Lewis*).

## Suborder TUBULIFERA.

Family *Idolothripidæ*.*Dicaiothrips stenocephalus*, sp. n.

♂.—Length 4·7, breadth of mesothorax 0·72 mm.

Dark brown, including all femora, tibiæ, and tarsi (excepting the fore-tarsi, which are yellowish). Antennal joint 3 light lemon-yellow, brown at apex; basal half of 4, except a narrow ring at extreme base, light yellow, and basal third of 5 yellowish-brown.

Head exceptionally long and slender, 3·3 times as long as broad at broadest; vertex produced; eyes occupying less than 0·2 the length of head; postocular and anteocular bristles long. Antennæ 1·4 times as long as the head, relative lengths of joints 3–8 approximately:—67 : 59 : 50 : 35 : 23 : 22. Mouth-cone very small and short.

Prothorax about 0·4 the length of head. Fore-femur



stout, a basal series of very stout dark spines on outer margin in addition to the usual bristles, and a yellow sickle-formed bristle at apex; fore-tibia very short and stout; tarsal tooth rather short.

Tube 0.68 as long as the head, slender; terminal hairs colourless, 0.65 the length of tube and those on tergite 9 not quite as long as tube.

Recognized by the long and slender head.

*Hab.* GERMAN EAST AFRICA: Moschi, 1 ♂ collected by Mr. C. Katona, Aug. 15, 1905 (National Hungarian Museum).

*Dicaiothrips proximus*, sp. n.

♂. Near *malayensis*, Bagn., a little longer and much stouter. Anterior femora very greatly enlarged, with a brown sickle-shaped bristle at apex. Head with vertex less noticeably prolonged; postocular bristles present. Antennal joints 3 and 4 subequal; 4 with basal third, and 5 basally yellowish. Prothorax much larger than in *malayensis*, not quite 0.5 the length of the head; disc sloping from basal margin, which is raised. Tube about 0.75 the length of head and longer than either of the abdominal segments 7 or 8; two stout spines on ninth sternite.

*Type.* In Hope Collections, University Museum, Oxford.

*Hab.* CEYLON: Peradeniya, 1 ♂ (in association with what is probably the ♀ of the species), from pods of *Crotalaria* sp., November 1912 (*E. E. Green*, No. 3180).

*Dicaiothrips greeni*, sp. n.

Length 7.2 mm.

This species comes in my first division of the genus, in which the head is produced beyond the eyes for at least the length of the eye and for more than the width at the base of the produced part.

Colour dark brownish-black; fore-tibiæ yellowish-brown; intermediate tibiæ brown, lighter at both ends; hind-tibiæ light at base, and shading to yellow distally. Antennæ with joint 3 yellow, brown at apex, basal half of 4 and third of 5 shaded to a light brown.

Head nearly 3.5 times as long as broad near base, the produced part occupying about 0.25 and the eyes 0.2 the total length. Postocular bristles long, and a second pair of dorsal bristles near basal fourth as in *Anactinothrips*, Bagn.,

and *Dracothrips*, nov.\* Antennæ moderately slender, fourth joint about 0·8 the length of third. Cheeks rather closely set with long and short setæ, somewhat as in *D. grandis*, Bagn.

Prothorax about 0·4 the length of head, setæ only moderately long, those at anterior angles directed forwards. Fore-femora incrassate, with numerous outer marginal setæ, including several unequal-sized longer ones, much as in *D. championi*, Bagn.; setæ light-coloured, a slender sickle-shaped brown spine at apex. Tarsal tooth long and sharp. Hind-legs very long and slender. Wings reaching to the fifth abdominal segment.

Abdomen long, segment 8 a little longer than 7. Tube slender, about 0·75 the length of the head and as long or a little longer than the seventh segment. Terminal bristles 0·8 the length and those on 9 almost as long as the tube.

*Type*. Hope Collections, University Museum, Oxford.

*Hab*. CEYLON: Peradeniya, 1 ♂ taken in association with another *Dicaiothrips* not yet determined, from decayed pods of *Phaseolus* sp. (*E. E. Green*, No. 3023). I have pleasure in naming the species in honour of its well-known discoverer, to whom I am indebted for much interesting material and information.

#### Genus DRACOTHRIPS, nov.

Near *Mecynothrips*, Bagn. Head widest at base, narrowing to eyes; eyes finely faceted, prominent; vertex strongly produced, produced part narrow at base and widening to seat of antennæ. Two pairs of dorsal cephalic bristles. Antennæ very long and slender. Prothorax without the long recurved prolongations seen in *Mecynothrips*, and fore-femora unarmed. Tube long.

*Type*. *Dracothrips ceylonicus*, sp. n.

#### *Dracothrips ceylonicus*, sp. n.

♂ (?).—Length a little over 7·0 mm.

Head broad at base, narrowing to about 0·7 that width at behind eyes; produced part not 1·5 times as long as eye, narrow at base. Antennæ very slender, about 1·4 times as long as head, joints 3–5 yellow, black at apices, 6 yellow at base; relative lengths of joints 3–5 approximately:—65:55:40. A pair of dorsal bristles in addition to the postocular pair, and three pairs of rather long genal setæ.

\* It should be noted that *Dicaiothrips denticollis*, Bagnall, a Malayan form, possesses this additional pair of dorsal cephalic bristles.

Prothorax with the bristles at angles set on warts, the front pair set directly forward. Fore-femur not strongly incrassate, with a few long colourless and faintly knobbed bristles. Fore-tibiæ yellowish-red; intermediate tibiæ shaded to yellow distally and hind-tibiæ yellow at knee and distal half.

Abdomen long and slender; tube 0.9 the length of head; bristles on segment 9 about 0.6 the length of tube.

I have not yet had the opportunity of re-examining the type of *Mecynothrips simplex*, Bagn. (in the British Museum), which I think will fall into this genus. *M. simplex* has the fore-femora strongly inflated, shining, sparingly setose, and armed with a short tooth at apex within, and the tube is shorter in comparison with the length of head.

*Type*. In Hope Collections, University Museum, Oxford.

*Hab*. CEYLON: Peradeniya, two examples, almost certainly males, swept from bushes (*E. E. Green*, No. 2961). They were in association with *Ecacanthothrips sanguineus*, Bagn.

### Family Megathripidæ.

#### *Siphonothrips brevis*, sp. n.

♂.—*Forma aptera*.

Length 2.1, breadth of mesothorax about 0.38 mm.

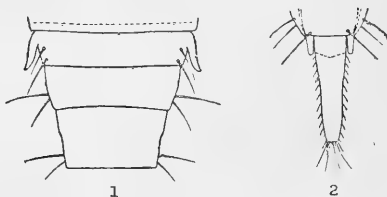
General colour dark black-brown, abdomen darker than the head and prothorax. All femora brown, the intermediate and posterior pairs light yellowish-white basally, and lighter at extreme base; all tibiæ yellow, tarsi also yellow with a dark patch on second joint. Antennæ with first two joints dark brown; second lighter apically; 3 yellow, lightly tinged with brown near apex; 4 yellow, apical fourth brown; 5 brown, with basal half yellow (6 to 8 broken off in type-specimen, 7 and 8 at least presumably totally brown).

Head 1.8 times as long as broad across eyes, 2.8 times as long as the prothorax, but only very slightly (0.08) longer than the tube. Cheeks very slightly incurved behind eyes and thence gently arcuate to base; a few minute genal spines. Vertex slightly produced beyond eyes, with a pair of rather long bristles, which do not reach to apex of first antennal joint. Eyes small, occupying laterally 0.2 the length of the head, finely faceted; ocelli minute. Mouth-cone reaching across prosternum, rounded at tip. Antennæ about twice as long as the head (first 5 joints = 1.5 times

the length of head); relative lengths of joints 1 to 5:—  
7 : 10 : 30 : 24 : 21.

Prothorax transverse, twice as broad as long; all setæ present, slightly knobbed, those at hind angles longest, almost 0·5 as long as the prothorax. Pterothorax a little broader than long, wings absent. First pair of legs rather short and somewhat stout; simple. Intermediate also short and somewhat stout; hind pair longer and more slender, femur 1·5 times the length of intermediate femur, broadest at distal third; tibia correspondingly long.

Side of abdomen gently arched to sixth segment, which is armed with a pair of short and comparatively stout, outwardly curved lateral processes and reaching slightly beyond the apex of segment; 7 evenly narrowing apically; 8 about as broad across apex as across base, with a pair of mid-lateral tubercles faintly suggested.



*Siphonothrips brevis*, sp. n., ♂.

1. Abdominal segments 6 to 8.

2. Tube.

Tube broadest at basal fourth, thence sharply narrowed, and continued to basal fifth or thereabouts, with the sides practically parallel, basal fifth sharply narrowed; viewed laterally the tube is sharply curved upwards at or about the basal third, so that the distal two-thirds is on a higher level than the base. Surface sparsely furnished with moderately short and very delicate hairs. Terminal bristles weak, only about one-third the length of the tube, light-coloured. Abdominal bristles also weak, those on 7 and 8 directed outwardly.

*Type*. In Hope Collections, University Museum, Oxford.

*Hab*. One male, coll. Prof. J. Sahlberg, Narenta.

### Family Phleothripidæ.

#### *Liothrips micrurus*, sp. n.

♀.—Uniformly dark brown, including fore-tibiæ, as in *L. major*, Buffa. Antennæ with second joint yellowish distally and 3–5 lemon-yellow, 4 and 5 deepening to

brownish-yellow distally, 6-8 light brown, 6 yellowish distally. Wings clear.

Head a little more than 1.5 times as long as broad; cheeks not converging posteriorly; vertex raised in form of hump. Antennæ 1.5 times as long as head, inserted below vertex, approximate, joint 3 not as broad as 2 and 4; relative lengths:—16 : 18 : 31 : 31 : 24 : 23 : 17 : 9. Eyes occupying one-third the length of head; fore-ocellus on apex of raised vertex, directed forwards. Postocular bristles set well in towards mid-line, very short and weak. Mouth-cone long and pointed, reaching to base of prosternum.

Prothorax with anterior margin strongly emarginate, more than twice as broad across hind-angles as long through middle, but only 1.5 times as broad as long, taking the length from posterior margin to a line drawn across anterior angles. Mid-lateral setæ absent, others short, the postero-marginal ones about 0.4 the length of prothorax through middle, and those on anterior margins about 0.2 as long. Pterothorax 1.5 times as broad as the prothorax and a little longer than broad.

Abdomen no broader than pterothorax, gradually narrowing to segment 7 and thence a little more rapidly to tube. Tube very short, not one-half (0.47) the length of head and only 1.38 times as long as segment 9. Sides straight, evenly narrowed from base, where it is about 2.25 times as broad as at apex and more than 0.6 as broad as long. Bristles at tip and on segment 9 about 0.8 the length of tube, weak and colourless; two pairs of wing-retaining spines on each of the tergites 2 to 7.

Separated from *elongatus*, Bagn. (Neotropical), which has also a very short tube, by the coloration of the antennæ.

*Type.* In Hope Collections, University Museum, Oxford.

*Hab.* One ♀, Matarieh, near Cairo, from *Zyziphus*, 9. ix. 1911 (*F. C. Willcocks*).

The type-specimen is cleared in potash, so that it is possible to get but an approximate idea of the coloration; the colour of the antennæ is taken from a second example captured by Prof. Sahlberg at Heluan. This example, carded, showed a pronounced metallic purplish coloration, but I do not think it was natural.

*Cryptothrips tenuipilosus*, sp. n.

♀.—Length 2.4 mm., breadth of mesothorax 0.52.

Colour chestnut to dark grey-brown, apical half of tube

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lighter than base; fore-tibiae yellow with inner and outer margins brown, fore-tarsi yellow. Antennæ brown, joint 3 yellow lightly tinged with brown distally; 4 light brown with basal third and tip yellow; 5 to 8 dark brown, 5 and 6 with basal fifth or thereabouts sharply yellow.

Head 1·23 times as long as broad just behind eyes, and 1·4 times as long as the prothorax; cheeks straight; evidently slightly diverging posteriorly, sparsely and minutely setose. Eyes finely faceted, occupying nearly 0·3 the length of head; space between them about three times the breadth of one of them. Ocelli large, posterior pair above a line drawn across middle of eyes and near their inner margins; anterior one forwardly directed. Postocular bristles long and very slender. Antennæ about 1·8 times as long as the head, relative lengths of joints 3 to 8 as follows:—24 : 25 : 24 : 19 : 18 : 14 — 3 and 4 equally broad and 5 about 0·2 narrower than either of them. Sense-cones short and stout, 2 (or more) on 3, 4 on 4, and 2 each on 5 and 6. Mouth-cone almost reaching across prosternum; basal joint of maxillary palpi longer than the distal joint.

Prothorax almost twice as broad as long; setæ very slender, those at anterior angles 0·4 and those at posterior angles 0·7 as long as the prothorax. Pterothorax large, 1·35 times as broad as prothorax and but slightly longer than broad. Fore and intermediate legs rather short, hind pair moderately long. Fore-femora slightly incrassate, tarsus unarmed. Wings reaching to about eighth abdominal segment, apparently slightly narrowed medianly; cilia dark.

Abdomen a little broader than pterothorax, gradually narrowing from segment 3 to 7, and thence more roundly and rapidly to base of tube. Tube 0·65 as long as the head, terminal hairs very slender, colourless distally, and about as long as the tube. Those on 9 exceptionally slender and also about as long as the tube; lateral bristles on 4–8 long, slender, colourless.

*Type.* In Hope Collections, University Museum, Oxford.

*Hab.* Corfu, 1 ♀ collected by Prof. J. Sahlberg, to whom I am indebted for a small but interesting collection, including the types of *Siphonothrips brevis* and the species here described.

Recognized by its short head, structure and coloration of antennæ, coloration of legs, and the unusually slender postocular, prothoracic, and terminal abdominal bristles.

*Cryptothrips insularis*, sp. n.

Length about 2.25, breadth of mesothorax 0.38 mm.

Near *C. dentipes*, Reut. Colour almost black; legs dark brown, tibiae somewhat lighter apically; tarsi yellowish-brown. Antennae concolorous with head, joint 3 yellow, dark brown near apex.

Form linear, apterous.

Head as in *dentipes*, about 1.25 times as long as broad behind eyes and about twice as long as the prothorax. Eyes small, occupying 0.25 the length of head, moderately finely faceted. Ocelli small, posterior pair widely separated and touching inner margins of eyes. Antennae 1.75 times the length of head, intermediate joints not elongated as in *dentipes*, 3-5 approximately subequal and but slightly longer than 6.

Prothorax transverse, about 1.8 times as broad as long; two foveae, one above the other, near each lateral margin. Pterothorax only a little broader than the width across fore-coxae, transverse. Legs somewhat short.

Abdomen elongated, linear, a little broader than the pterothorax; segments 8-9 sharply narrowing to base of tube. Tube short, stout, 0.6 the length of head. Setae indeterminable in the carded specimen.

*Type*. In the British Museum of Natural History.

*Hab*. Canary Isles (*T. V. Wollaston*).

The shape of the head is almost exactly as in *C. dentipes*, but not quite so broad. From this species it is readily separated by its linear form, the short antennae (twice as long as the head in *dentipes*) and short intermediate joints, the darker fore-tibiae, shorter legs, and the short tube, which in *dentipes* is as long as the head.

## Genus MICROCANTHOTHRIPS, nov.

For some time I have been aware that my *Cephalothrips spinosus* could not be retained in that genus. A very strong artificial light enables one to examine the femora tucked up under the head through the dark chitin, and I have thus drawn up the following brief diagnosis, which is sufficient to characterise the genus for the time being. If further specimens do not come to hand, I propose to carefully remount the unique preparation.

It cannot be referred to any of the known genera with armed fore-femora, and would seem to come in the *Haplothrips* group.

Head only slightly longer than broad; eyes small; mouth-cone rounded and reaching almost across prosternum. Antennæ not quite twice as long as head, unusually massive; joint 7 constricted at base with a short stem, joined broadly to 8; 3 longer than any of the others. Fore-femur with a

Fig. 3.



*Microcanthothrips spinosus* (Bagnall). Outline of fore-femur.

long sharp process at middle within; tibia stout; tarsal tooth small. Abdominal segments 4-7 at least with a stout spine-like seta (in addition to a long stout bristle) at each posterior angle and a short but similar postero-marginal spine within.

Type. *Cephalothrips spinosus*, Bagn.

#### SYNONYMICAL NOTES.

##### *Limothrips angulicornis*, Jablonowski.

1894. *Limothrips angulicornis*, Jablonowski, Természetrájsi Füzetek. xvii., Budapest, pp. 44-47, pl. iii.

1912. *Limothrips setariæ*, Jones, Tech. Ser. 23, Bur. Ent., U.S. Dept. Agric. pp. 8-10, pl. iii.

When Mr. Jones described his *L. setariæ* I thought it would probably be the same as the species described by Dr. Jablonowski eighteen years previously from Armenia and Hungary, but it seems to be a rare species and I had not then seen examples. I have now before me several females and one male of a *Limothrips* collected by Dr. Anton Krausse, at Sorgono, Sardinia, in 1913, which agree in every detail with Jones's description and figures, though darker in colour, and which I have little doubt are referable to *Limothrips angulicornis*. Dr. Jablonowski does not figure the stout terminal spines, nor does his figure of the chaetotaxy of the fore-wing agree, but we see exactly similar discrepancies in his figures of *Limothrips cerealium* (*op. cit.* xvii. 1894, pts. 3 & 4, pl. iv.) appearing in a later part of the same publication.



*Dendrothrips ornatus* (Jablonowski).

1894. *Thrips ornata*, Jablonowski, Termesz. Füzetek. xvii., Budapest, pp. 93-99, pl. iv.

1895. *Dendrothrips tilia*, Uzel, Monogr. der Ordnung Thysanoptera, pp. 160-162, pl. ii. fig. 15, and pl. vi. figs. 84-86.

Jablonowski's memoir was evidently issued whilst Uzel's work was in the press, and is not noticed in the latter author's bibliographical notes.

*Baliothrips dispar*, Haliday.

1911. *Bagnallia agnessæ*, Bagnall, Journ. Econ. Biol. vi. p. 7, and in later papers.

The maxillary palpus of *agnessæ* is undoubtedly 2-segmented, thus bringing the species into the genus *Baliothrips*, and I think there is no doubt that it should be referred to *B. dispar*, though my examples are much larger than described by Uzel. Having overlooked its generic position, this accounts for my previous inability to recognize this not uncommon species, *B. dispar*, in Britain.

I am indebted to Mr. Douglas Hood, who detected the synonymy in working out the North-American species, for bringing this to my notice.

Genus *SCOLOTHRIPS*, Hinds.

1902. *Scolothrips*, Hinds, Proc. U.S. National Mus. xxvi. p. 157.

1910. *Chetothrips*, Schille, Acad. Litt. Cracov. xlv. p. 5 (*separatim*).

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XXXII.—*Notes on Varanosaurus acutirostris*, *Broili*. By D. M. S. WATSON, M.Sc., Lecturer on Vertebrate Palæontology, University College, London.

ONE of the greatest treasures of the Palæontological Museum in Munich is the imperfect skeleton which forms the type specimen of *Varanosaurus acutirostris*, *Broili*.

Although Prof. *Broili*'s description is both accurate and excellent, the great additions to our knowledge of the skull-structure of early types which have been made during the last ten years allow of a more critical examination of the specimen, which I am enabled to offer owing to the great kindness of Prof. *Broili*, through whose friendship I have been able to examine the whole of the valuable series of Permian reptiles belonging to the Alte Akademie at Munich.

Amongst some undetermined fragments belonging to the specimen, I was fortunate enough to recognize both articular

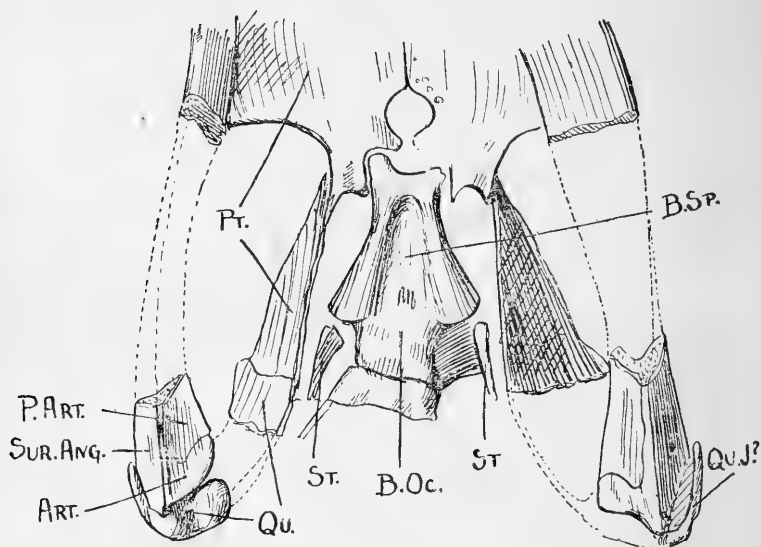
regions of the skull and lower jaw; and, although so much is missing that the contacts are lost, these fragments add considerably to our knowledge.

The material is in excellent condition, nearly all the sutures being visible, some with very great clearness; it is also excellently prepared\*.

*Basis cranii.*

The basioccipital condyle is largely concealed by the

Fig. 1.



*Varanosaurus acutirostris*, Broili. Type specimen,  $\times 1$ . The posterior part of the skull viewed from below, with the articular regions replaced as nearly in the natural position as possible.

ART., articular; B. OC., basioccipital; B. SP., basisphenoid; P. ART., pre-articular; PT., pterygoid; QU., quadrate; QU. J. ?, quadrato-jugal ?; ST., stapes; SUR. ANG., surangular.

atlas, which is in position; the condyle is, however, obviously single and slightly pedunculate; on the lower surface the

\* Since this paper was written, Prof. Broili has published an excellent new account of the structure of the anterior part of the skull, which should be referred to in connection with the present paper (Central. f. Min. &c., 1914, No. 1).

bone is short, and, if the suture is correctly recognized, contributes scarcely at all to the tubera basisphenoidales.

The basisphenoid is a large bone, whose lower surface is provided with two very pronounced ridges, which, starting at the tubera, run forwards along the lower surface until they terminate in front in well-developed basiptyergoid processes, which support the pterygoids by definite articulations. In front of this region the bone is concealed by matrix and the pterygoids, but through the right orbit it can be seen to be continued forwards by a long and very massive parasphenoid, whose upper border is grooved in front and supports an ethmoid, the visible portion of which forms a thin median septum. In front the parasphenoid seems to be clasped by an ascending flange of the pterygoid.

### *Pterygoid.*

The pterygoid is the usual triradiate bone, articulating by a distinct facet with the basiptyergoid process; the anterior ramus runs forward as a plate on the palate, soon joining with its fellow, so as to leave only a very small interptyergoid vacuity. The internal ramus forms the usual process against the side of the lower jaw, but the structure of the palate cannot be made out. The posterior ramus is a deep thin plate running backwards behind the quadrate to the extreme hinder end of the skull; on the left side it can be distinctly seen to come into contact with the squamosal, exactly as in a *Stegocephalian*.

### *Quadrate.*

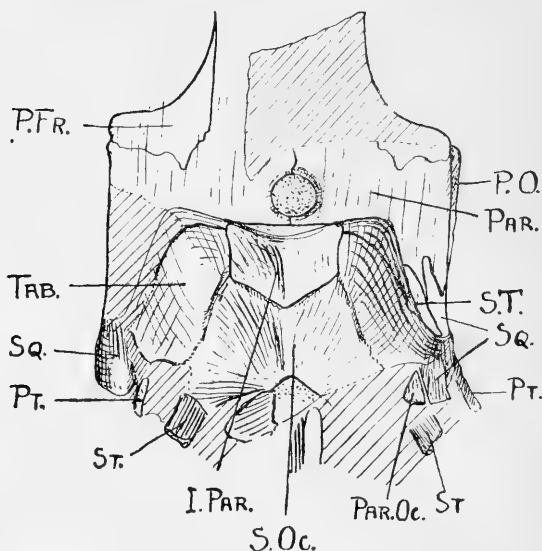
The quadrate is represented by the anterior part of the pterygoid ramus, which, on the right side, is clearly seen to lie on the outer side of the posterior ramus of the pterygoid as a very thin film of bone. The articular region is well preserved on the right side. There is a pulley-shaped condyle, above which the bone rises as a massive sheet. The outer surface is obviously covered by membrane-bone, the squamosal, and probably also the quadrato-jugal; there are, however, only very faint traces of sutures, and no quadrate foramen.

On the inner side, well above the condyle, is a deep and very well-marked step, which can only have served for the articulation of the outer end of the stapes.

*Back of the Skull.*

The back of the skull is quite well preserved, and, despite the presence of many cracks, it is possible to make out the main lines of its structure with absolute certainty.

Fig. 2.



*Varanosaurus acutirostris*, Broili. Type specimen,  $\times 1$ . The posterior part of the skull from above.

Reference-letters as before, with:—I.PAR., interparietal; P.FR., postfrontal; P.O., postorbital; PAR., parietal; PAR.Oc., paroccipital; S.Oc., supraoccipital; Sq., squamosal; S.T., supratemporal; TAB., tabular.

*Parietal.*

The parietals extend out, in the postorbital region, to the edge of the flat dorsal surface; in front they meet the frontals; just behind the orbits their outer borders have a square step, by which they articulate with the postfrontals; posteriorly their borders are turned down and covered by the interparietal and the tabulares; at the postero-lateral corner they articulate by suture with the supratemporal and squamosal, and the rest of the lateral border overlies the postorbital.

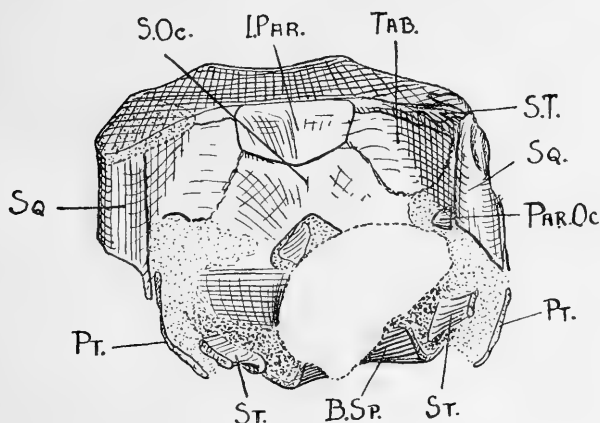
*Interparietal.*

The interparietal is an almost flat bone, with a low median ridge on its posterior surface; it covers the hinder ends of the parietals above, and its lower border overlaps the supraoccipital, whilst its lateral borders are in contact with the tabulares. In the specimen it is traversed by a vertical crack which looks like a median suture; as, however, it turns out of the middle line towards the bottom, and as the structure seems to show that the bone is single, I have disregarded it.

*Tabular.*

The tabular is a thin bone lying entirely on the posterior surface and covering the parietal, supratemporal, squamosal, and supraoccipital. Owing to crushing, the suture with the supraoccipital is not very clear on either side, and it is not possible to say whether the bone reached down outside the post-temporal fossa to the end of the paroccipital.

Fig. 3.



*Varanosaurus acutirostris*, Broili. Type specimen,  $\times 1$ . Skull viewed from behind, with the vertebral column which covers the unshaded area supposed removed.

Reference-letters as before.

*Occiput.*

The occipital and otic bones cannot be separately recognized. The foramen magnum is of fair size, and above it

the supraoccipital inclines forwards ; it is a broad flat plate provided with a low median ridge, and its upper and outer edges are covered by the interparietal and tabulares. The post-temporal fossæ are not well shown, but on the left side the upper border is clear as a smooth notch on the lower edge of the tabular, and something is seen of the paroccipital process below it on the right side, where its end is in contact with the squamosal. It is certain from the condition on either side that the fossa was very small.

Below the post-temporal fossa there is a considerable expanse of bone visible on the left side, which is partly basioccipital. The foramina in this region are not visible, but the position of the inner ends of the stapes, which agrees on the two sides, shows that the fenestra ovale lay very low down just above the tubera basisphenoidales.

#### *Supratemporal.*

As shown on the right side, the supratemporal is a very small bone having a suture with the parietal and wedged in between the tabular and the squamosal. In front the suture is perfectly clear, and was represented in Prof. Broili's original figure ; behind, although not so clear, it is, I think, fairly certain. It is unfortunate that the loss of this region on the left side prevents corroboration there.

#### *Squamosal.*

The upper part of the squamosal is in contact with the lower surface of the parietal, which terminates behind in a suture with it. In front it touches the postorbital, so as completely to exclude the parietal from the temporal fossa. Further back it forms a plate on the side of the skull, curves round on to the back, and then still further until it plunges under the tabular and paroccipital ; below the post-temporal fossa it is clearly shown on the left side to be overlapped by the pterygoid.

On the right side what is either the lower end of the squamosal or the striated surface to which it was attached is seen on the outer and posterior side of the quadrate some distance above the articulation.

#### *Stapes.*

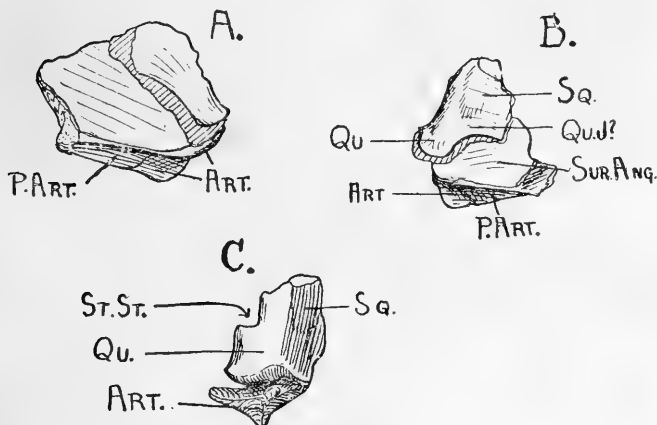
The proximal end of the stapes is in position on both sides ; it is an extremely massive bone, consisting of a laterally compressed shaft which expands considerably at the fenestra ovale ; it cannot be seen if it is perforated for the stapedia artery.

*Temporal Fossa.*

It is quite certain from the condition of the postorbital arcade, which is perfectly preserved on each side, that there is only one lateral temporal fossa. Whether this was not closed below by an arch, as in Williston's *Varanosaurus brevirostris*, is not by any means certain.

On the right side the jugal is continued back as a broad bone on the side of the skull for a centimetre behind the postorbital bar, and on the same side the bone which covers the outer side of the quadrate (probably the quadrato-jugal) is continued forwards with a horizontal lower border, as if to meet the jugal. The condition of this region is much more like that of *Theropseura* or *Ophiacodon* than of *Varanosaurus brevirostris* as figured by Williston.

Fig. 4.



*Varanosaurus acutirostris*, Broili. Type specimen,  $\times 1$ .

- A. Left articular region, outer aspect.
- B. Right articular region, outer aspect.
- C. Right articular region, from behind.

Reference-letters as before, with:—St.St., step on the quadrate for the distal end of the stapes.

*Lower Jaw.*

Of the anterior part of the mandible little can be said. There is a splenial entering the symphysis, and the ramus is very narrow from side to side.

The posterior part of each ramus is well preserved.

The articular is a large bone ; its condyle is damaged by excessive development, but it must have greatly resembled that of *Dimetrodon*. There is no appreciable postarticular process. The outer surface of the bone is completely covered by the surangular, which is separated by visible suture. The inner surface is to a large extent covered by the prearticular, which, however, does not touch the surangular, so that a sharp narrow ridge of articular is visible from below.

[I think it probable that a considerable part of the present outer surface of the surangular was formerly covered by the angular, which may have been stripped off during development.]

#### *Atlas.*

The intercentrum of the atlas is well preserved ; it forms a short broad band across the basioccipital condyle, whose posterior outer corners carry ribs. The neural arches of the atlas and, I think, but am not sure, a proatlas are present, very much crushed.

#### *Vertebræ.*

One feature of the vertebræ, already described by Dr. Broili, deserves to be emphasized ; this is the relative heaviness of the neural arches and the fact that the articulating faces of the zygapophyses are horizontally placed.

#### *Ribs.*

The ribs appear to have been holocephalous throughout the column, with, perhaps, the exception of a few anterior pairs. Some of the ribs in the region of the pectoral girdle are flattened and expanded, like those of many cotylosaurs.

#### *Pectoral Girdle.*

The cartilaginous part of the left side of the shoulder-girdle is very well preserved, except for the upper end of the scapula.

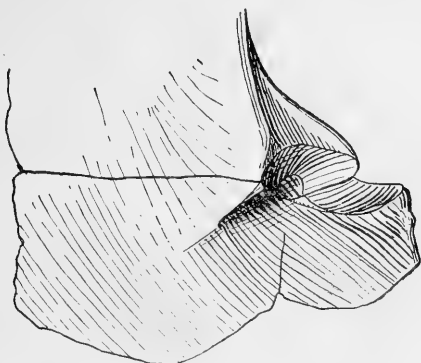
It is extraordinarily like that of *Ophiacodon* as figured by Williston.

The scapula is a broad thin bone, thickened at its posterior edge, rising from the border in the powerful process which supports the anterior part of the glenoid cavity. The



articular region is clearly marked off from the rest of the bone, and the whole glenoid cavity forms a screw-shaped piece of the surface of a cylinder whose axis stands in a vertical plane pointing downwards towards the front at an angle of about  $60^{\circ}$ .

Fig. 5.



*Varanosaurus acutirostris*, Broili. Type specimen,  $\times 1$ .  
Left cartilaginous shoulder-girdle.

The anterior coracoidal element is clearly separated from the scapular by a suture, which has parted, allowing the bones to separate by a little less than a millimetre. The anterior coracoidal element has a process which joins with that of the scapula which supports the anterior end of the glenoid cavity.

Behind this process is a deep pocket, from which the coracoid and glenoid foramina must start. If the suture between this bone and the scapula be correctly determined, of which I think there is no doubt, the bone only supports an extremely small piece of the glenoid cavity, if any at all.

The posterior coracoidal element is a small bone separated from the scapula by an obvious suture and from the anterior element by a faint and incomplete one.

That the bone is really distinct is certain, as it is indicated by the texture, the shape of the internal surface, and its perfect resemblance to *Ophiacodon*. The bone carries a large part of the glenoid cavity, and has a low process on its posterior edge.

*Pelvic Girdle.*

The only new point of interest about the pelvic girdle is the presence of a thickened bar across the pubes, so that the symphysis is suddenly thickened as in *Labidosaurus* at one point.

*Comparison with V. brevirostris.*

The reptile whose structure has just been described differs from that described by Williston as *Varanosaurus brevirostris* in a considerable number of characters. Williston has already listed the skull-proportions and the dentition. To these we may add :—

The holocéphalous ribs.

The flattened and expanded ribs in the pectoral region.

The horizontally placed zygapophysial articulating surfaces and the rather heavier arches of the type species.

The presence of two coracoidal elements in the type.

The thickening of a part of the pubic symphysis.

The very probable presence of a complete temporal arcade in the type.

Williston's animal is, in fact, a more specialized type, quite worthy of generic rank.

*Comparison with Dimetrodon.*

With fuller knowledge, the skull of *Varanosaurus* shows many rather unexpected resemblances to that of *Dimetrodon*.

Comparison of the figures in this paper with those given by Case, Broom, and especially fig. 44 of v. Huene's recent paper\* will show at once great resemblances in the back of the skull and the relations of the interparietal and tabulares, and particularly the relation of the supratemporal to the parietal, tabular, and squamosal.

The structure of the back of the lower jaw is also very similar in the two types.

In fact, there can be no doubt that Broili was perfectly correct in his original idea that *Varanosaurus* is a Pelycosaur; there is also no doubt that it is a primitive member of that group. In a paper now in the press I have shown, following Broom, that the Pelycosaur is truly members of the same great group as the South-African Therapsids, differing only in the more primitive features of the limbs

\* Bull. Amer. Mus. Nat. Hist, vol, xxxii. art. xviii, p. 359.

and the occasional presence of a supratemporal. *Varanosaurus* is thus probably the most primitive known member of the mammal-like reptiles, and is of very great interest from the standpoint of the origin of that group.

In the paper referred to above I have listed the important characters which are common to all South-African Therapsids as follows :—

1. There is one lateral temporal fossa bounded primitively by the postorbital and squamosal alone, the parietal and jugal entering later into its borders.
2. The occiput is plate-like.
3. The interparietal and tabulares are on the back of the skull overlapping the supraoccipital.
4. The brain-cavity is very high.
5. The ear is very low on the side of the brain-cavity.
6. There is only one temporal element, the squamosal.
7. There are two coracoidal elements, the anterior not contributing to the glenoid cavity.
8. The flat angular [notched behind].
9. The contact of the outer end of the stapes with the quadrate.

*Varanosaurus* possesses all these characters except 6, from which it differs by the presence of a minute supratemporal, which is obviously vanishing.

No. 5 is not very definitely known in *Varanosaurus*, but, judging from the position of the fenestra ovale, it is possessed.

Although the angular is not actually present, the appearances of the other bones show conclusively that *Varanosaurus* had a typically Therapsid lower jaw.

*Varanosaurus* thus possesses all the fundamental Therapsid characters. It has also the following primitive features :—

1. The retention of a vestigial supratemporal.
2. The retention of the primitive union of the squamosal and pterygoid behind the quadrate.
3. The Cotylosaurian-like basisphenoid.
4. The deep posterior ramus of the pterygoid.
5. The extension of the lachrymal forward to the septomaxilla.
6. The heavy neural arches and horizontal zygapophysial articulating faces.
7. The intercentra throughout the column.
8. The holoccephalous ribs.
9. The expanded ribs in the pectoral region.
10. The primitive form of the glenoid cavity.
11. The primitive humerus.
12. The primitive type of femur.

All these features are found in Cotylosaurs, many of them also in Temnospondylous Stegocephalia, and, taken together, render it certain that the Therapsid group was derived from a Cotylosaurian reptile.

When comparing together the remains of Texas reptiles in Munich, I was very much impressed by the many resemblances (some only of a very superficial character) between *Varanosaurus* and the Captorhinidæ. These may be listed as follows :—

1. The triangular skull, with a much narrowed preorbital region.
2. The deflected premaxillary dentigerous border, so that the incisor teeth are inclined backwards.
3. The identical arrangement of the bones of the face. Compare especially the lachrymal reaching the septomaxilla in each. The long, straight, antero-posteriorly directed sutures between the prefrontal and lachrymal and the frontal. The entrance of the latter bone into the orbital margin for a very short distance, &c.
4. The fact that the squamosal is the important bone in the temporal region, the rudimentary supratemporal in *Captorhinus* occupying an exactly similar position to that of *Varanosaurus*.
5. The apparently identical relations of the quadrate to the squamosal.
6. The epipterygoids are similar in the two types.
7. The articulation of the end of the paroccipital process with the squamosal.
8. The vertical position of the postparietals = interparietal.
9. The heavy stapes articulating with a fenestra ovale placed so low down that the lower edge is in contact with the basisphenoid, only just above and behind the tubera basisphenoidales.
10. The absolute identity of the basisphenoid in the two types.
11. The presence of a long strong parasphenoid in both. [Shown very clearly in a Munich specimen of *Labidosaurus*.]
12. The heavy and slightly swollen neural arches and horizontally placed articulating facets of *Varanosaurus* recall those of *Labidosaurus* more than any other type.
13. The resemblance, almost amounting to identity, between the cartilaginous shoulder-girdles. [I only know *Labidosaurus* in not very well-preserved material.]

14. The considerable resemblance between the humeri of the two types.
15. The sudden thickening of the symphysis between the pubes.
16. The femora present many curious resemblances.

The types differ in the following features:—

1. The supraoccipital of *Labidosaurus* is narrow and quite unlike that of *Varanosaurus*.
2. The post-temporal fossæ are not small and widely separated in the Captorhinidæ.
3. The angular is not flat and the lower jaw not in the least Therapsid in *Labidosaurus*.

It will be noticed that those features in which the two types differ are *characteristic of the Therapsid* group as a whole.

Of the other typical Therapsid characters, the most important are the high brain-cavity and the low position of the ear, of which the material at my disposal did not give quite satisfactory information, but suggests that in these features *Labidosaurus* agrees with the Therapsid type.

This series of resemblances and differences are exactly what one would expect if the Captorhinidæ are the comparatively little modified descendants of the group of Cotylosaurs from which the Therapsid phylum sprung; in curious characters, mostly of trivial morphological importance, *Varanosaurus* resembles them exactly. In the important features which proclaim it a typical member of the Therapsid stock, it differs entirely from them, with probably one very important exception—that the brain-cavity of both types is similar, and different from that of other Cotylosaurs and other reptiles. If this is so, and it will be remembered that the evidence is very unsatisfactory, we have again a fine illustration of the fact that the leading part of evolution takes place in the brain, changes in which long precede those of other parts of the organism.

One interesting point on which light is shed by *Varanosaurus* is the identification of the temporal bones.

There is not the faintest doubt that the bone I have called squamosal is the same as the mammalian bone of that name. In all its relations and appearances it agrees with that of the Deinocephalia, from which we have a continuous series, with

no gaps of any size, to the Cynodonts, the resemblance of whose skull to that of a mammal is so close as to render the determination of the bones quite certain.

The only other temporal bone, the supratemporal, lies between the squamosal, parietal, and tabular. This is the position held by the upper bone in all Cotylosaurs and Stegocephalia in which two are present.

It is thus shown by direct tracing that the outer temporal element—that which in Stegocephalia lies below the auditory notch and passes round behind the quadrate to touch the pterygoid—is the mammalian squamosal, and should be called by that name.

In conclusion, I wish to express my gratitude to Prof. Broili, not only for so kindly allowing me to describe his valuable material, but also for his many personal kindnesses during my visits to Munich.

### XXXIII.—*A Revision of the Family Pyrochroidæ (Coleoptera).*

By K. G. BLAIR, B.Sc., F.E.S.

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[Plate XII.]

THE Pyrochroidæ may be shortly characterized as Heteromera having the anterior coxal cavities open behind; the head, which is held horizontal, constricted into a neck behind; the prothorax at base markedly narrower than the base of the elytra; the tarsal claws simple; the antennæ, at any rate in the male, ramose; and the eyes large, and emarginate for the insertion of the antennæ.

Lacordaire, in Gen. Col. v. 1859, only recognized three genera—*Pyrochroa*, *Schizotus*, and *Dendroides*,—although he included a fourth, *Lemodes*, with an expression of doubt as to its true position. The genus *Pogonocerus*, Fisch., he considered to be synonymous with *Dendroides*, Latr.

Since that date the constitution of the family has remained almost unaltered; a few new genera have been added (*Ischalia*, Pasc = *Eupleurida*, Lec., and *Pilipalpus*, Fairm.). The genus *Pedilus*, Fisch., has by some authors been placed here. Though there is much to be said in favour of enlarging the scope of the family to include this genus, and perhaps

*Ischalia*, yet Pic, in Junk's 'Coleopterorum Catalogus,' pt. 26, 1911, retains them in the family Pedilidæ; where, perhaps, they are best left for the present. Neither does *Pilipalpus* come within the Pyrochroidæ, but, with *Cycloderus*, Sol., *Techmessa*, Bates, and *Pseudananca*, Blbn., is better placed as a rather aberrant group of the CEdemeridæ. These genera all have the eyes very prominent and entire, and the head, though sharply narrowed behind, not constricted into a definite neck. *Pseudolycus* (?) *apicalis*, MacL., which Blackburn suggested might belong to the Pyrochroidæ, also belongs to this group. The genus *Lemodes* belongs to the Anthicidæ (Ann. & Mag. Nat. Hist. (8) xi. p. 207).

Thus the family is still left with the original three genera recognized by Lacordaire, with the exception that *Pogonocerus*, Fisch., must be accorded distinct generic rank.

On the other hand, the number of described species has increased very materially. In Gemminger and Harold's 'Catalogue,' 1870, twenty species are enumerated; Champion's Supplement (1898) added twenty-nine, and fifty-eight more have been added since that date. Of all these, however, about twenty have been removed to other families (mostly with the genera *Ischalia* and *Lemodes*), so that there remain about ninety described species and varieties.

The most noteworthy point about this increase is the extension of the area of the known distribution of the family. Formerly it was supposed to be almost confined to the north temperate region, but a great number of species are now known from India, even from Southern India, though none have yet been recorded from Ceylon, and particularly from the Malay Peninsula and its associated islands (Sumatra, Java, and Borneo).

In spite of their paucity in numbers the genera of the Pyrochroidæ have been very generally misunderstood. Two of them were founded upon North-American species (*Dendroides*, Latr., and *Schizotus*, Newm.), and the numerous Old-World species added to them later by European authors are, without exception, wrongly placed, and would be with better reason assigned to *Pyrochroa*. This genus is thus left with by far the greater number of the described species of the family, and forms a heterogeneous assortment that may with advantage be split up into numerous subgenera, or, as I prefer to consider them, genera.

Some attempt has already been made to this end; thus we have:—

*Hemidendroides*, Ferrari (proposed as a subgenus of *Dendroides*), for his new species *ledereri*.

*Pseudopyrochroa*, Pic, for *P. deplanata*, Pic, a group which includes the bulk of the Oriental species.

And, more recently, *Pyrochroella*, Reitt., for *P. pectinicornis*, L.

The incorrect assignation, mentioned above, of certain species to *Dendroides* and *Schizotus* is also a recognition of their generic distinction from *Pyrochroa*.

The present paper is an attempt to coordinate and extend these efforts, and, though necessarily, from lack of knowledge and lack of material, full of defects, it is hoped that the very obviousness of these may help to remedy some of them and supply the deficiencies.

I must express my deep indebtedness to numerous coleopterists for the valuable and kindly aid they have rendered me, as well by the communication of notes and specimens as in allowing me to examine types in their possession. My thanks are particularly due to Messrs. H. E. Andrewes and G. E. Bryant, to M. Pierre Lesne and the authorities of the Paris Museum, and, above all, to M. Maurice Pic, who has not only been most generous in giving me all information at his disposal, but whose hospitality has enabled me to examine the whole of his rich collection of this family.

### *Table of Genera.*

- |   |                                 |
|---|---------------------------------|
| 1. (8) Eyes very large, approximate above in ♂.   |                                 |
| 2. (3) Third joint of antennæ minute, like the second .....   | <i>Pogonocerus</i> , Fisch.     |
| 3. (2) Third joint of antennæ elongate, much larger than the second .....   | 4.                              |
| 4. (5) Antennæ very slender; ramus of third joint in ♂ about three times as long as the shaft .....   | <i>Dendroides</i> , Latr.       |
| 5. (4) Antennæ less slender; third joint in ♂ produced into a short ramus not longer than the shaft .....   | 6.                              |
| 6. (7) Branches of antennæ in ♂ lamelliform.  | <i>Phyllocladus</i> , g. n.     |
| 7. (6) Branches of antennæ in ♂ of normal form .....  | <i>Pseudodendroides</i> , g. n. |
| 8. (1) Eyes moderate, separated in ♂ by a space at least as wide as one of them.  | 9.                              |
| 9. (10) Eyes large, occupying almost the whole side of the head behind the antennæ, genæ behind them very much reduced. (Species North American.) ..... | <i>Neopyrochroa</i> , g. n.     |
| 10. (9) Eyes smaller, leaving distinct genæ between them and the neck .....   | 11.                             |
| 11. (16) Head triangular in outline, genæ prominent. ....   | 12.                             |



- |  |                                |
|--|--------------------------------|
| 12. (13) Head in ♂ excavate behind eyes . . .                            | <i>Hemidendroides</i> , Fisch. |
| 13. (12) Head in ♂ not excavate behind eyes.                             | 14.                            |
| 14. (15) Genæ conical, sides of thorax angulate<br>before base . . . . . | <i>Eupyrochroa</i> , g. n.     |
| 15. (14) Genæ rounded, sides of thorax rounded.                          | <i>Pyrochroa</i> , Geoff.      |
| 16. (11) Head not triangular in outline, genæ<br>not prominent . . . . . | 17.                            |
| 17. (18) Head in ♂ excavate behind eyes . . .                            | <i>Schizotus</i> , Newm.       |
| 18. (17) Head in ♂ not excavate behind eyes.                             | <i>Pseudopyrochroa</i> , Pic.  |

POGONOCERUS, Fisch.

Although this genus was placed as a synonym of *Dendroides* by Lacordaire and also in Gemminger & Harold's 'Catalogue,' Reiche has demonstrated (Bull. Soc. Ent. France, 1878, p. lxxiii) that it is abundantly distinct. It differs from every other genus in the family in having the third joint of the antennæ small, even smaller than the second.

The only species is *P. thoracicus*, Fisch.

DENDROIDES, Latr.

Considerable misconception seems to have existed in the minds of European coleopterists as to the scope of this genus, and the numerous Old-World species assigned to it by various authors (*e. g.*, Lewis, Pic, and myself) are really quite apart from it.

The type of the genus is *D. bicolor*, Newm. (= *canadensis*, Lec.).

The species may be distinguished as follows:—

- |  |                           |
|--|---------------------------|
| 1. (4) Head and elytra blackish, thorax red . .  | 2.                        |
| 2. (3) Legs reddish testaceous. (Pl. XII.<br>figs. 1, 1 a.) . . . . .  | <i>bicolor</i> , Newm.    |
| 3. (2) Legs black, with base of femora and<br>coxæ ferruginous . . . . .   | * <i>picipes</i> , Horn.  |
| 4. (1) Species unicolorous, reddish testaceous<br>or piceous . . . . .   | 5.                        |
| 5. (10) Species reddish testaceous. (North<br>American.) . . . . .   | 6.                        |
| 6. (7) Antennæ of ♀ with joints 3-6 trian-<br>gular, the following gradually more<br>and more produced at the extremity .    | * <i>testaceus</i> , Lec. |
| 7. (6) Antennæ of ♀ with branch of sixth<br>joint nearly as long as that of seventh.   | 8.                        |
| 8. (9) Thorax as long as broad; eyes in ♂ al-<br>most contiguous for some distance<br>along middle line: species shorter . . | <i>concolor</i> , Newm.   |

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\* Species marked with an asterisk I know only from description.

9. (8) Thorax slightly transverse; eyes in ♂  
diverging before and behind their point  
of nearest approach: species more  
elongate and more nitid ..... *ephemeroides*, Ménét.  
10. (5) Species piceous. (Japanese.) ..... *lesnei*, sp. n.

*D. testaceus*, Lec., was described upon a single female example from Lake Superior, and I am not aware of any subsequent records of its occurrence.

*D. lesnei*, sp. n., resembles *D. concolor*, Newm., but is pitchy brown in colour. The eyes in the ♂ are separated by a space about as wide as the thickness of the second joint of the antennæ. The thorax is fully as long as broad, broadest about the middle, becoming slightly narrower towards the base, which is sharply margined and more rapidly narrower to the apex; the disc is nitid, clothed with a scanty pubescence, with a slight median depression before the base. The elytra are subparallel, with the lateral margins visible from above for the posterior three-quarters of their length; they are moderately nitid, punctate, with a thin pubescence and slight indications of longitudinal furrows as in *D. ephemeroides*.

Long. 13–17 mm.

*Hab.* Japan, Yumo to near Chuzenji, and to near Nikko, Aug. 1909 (*E. Gallois*); environs of Tokio (*J. Harmand*, 1906). Communicated by the Paris Museum.

It is curious that a species of this genus should at last have been discovered in Japan, since the two Japanese species ascribed to it by Mr. Lewis belong to a distinct genus (*Pseudodendroides*, gen. nov.).

#### PSEUDODENDROIDES, gen. nov.

Differs from *Dendroides*, Latr., in the less parallel, more depressed form, in the denser puncturation and pubescence of the elytra, and in the much stouter antennæ, of which the branches in the ♂ are not exceptionally long and slender. From *Pseudodendroides*, Pic, which it more closely resembles, it may at once be separated by the large eyes, approximate above in the ♂. (Type, *P. niponensis*, Lew.)

The species placed here, which were all originally assigned to *Dendroides*, Latr., may be tabulated as follows:—

1. (4) Second joint of antennæ longer than broad;  
joints 4–10 of ♂ scarcely broader towards  
apex; colour blackish piceous, with pur-  
plish-red elytra. (Japan.) ..... 2.

- |   |                          |
|---|--------------------------|
| 2. (3) Size larger (17 mm.); eyes of ♂ separated by a space about as wide as the length of second joint of antenna .....    | <i>niponensis</i> , Lew. |
| 3. (2) Size smaller (13 mm.); eyes of ♂ almost contiguous above .....   | <i>ocularis</i> , Lew.   |
| 4. (1) Second joint of antennæ strongly transverse; joints 3-6 of ♂ subtriangular; upper surface unicolorous, fulvous ..... | 5.                       |
| 5. (6) Legs testaceous. (S. India.) .....   | <i>madurensis</i> , Pic. |
| 6. (5) Legs and underside fuscous. (Assam.) (Pl. XII. fig. 2.) .....  | <i>assamensis</i> , Blr. |

### PHYLLOCLADUS, gen. nov.

Both the species that are placed in this genus were originally described as belonging to *Dendroides*. Though the eyes in the male are more closely approximate than is usual in *Pyrochroa*, the structure of the whole insect, especially that of the head and antennæ, is very different from that of *Dendroides*. The head is elongate, with the frontal sculpture of the ♂ of a different type from that usual in the family, taking the form of two longitudinal subcontiguous depressions. The most remarkable feature of the genus, however, is afforded by the antennæ in the ♂. The appendage of each joint arises as a flat expansion along the length of the joint, and forms a lamellate ramus, each of which is twisted on its axis, so that they lie one against another like the pages of a book. The second joint is elongate. Antennæ of very similar form are found in *Pseudopyrochroa antennalis*, Blr.

The two species placed here are very similar, being large, with black head and bright red thorax and elytra. M. Pic has kindly compared them for me, and says that they are certainly distinct, *P. magnificus*, Blr., from Burma, having a smaller head and the elytra more expanded behind than *P. grandipennis*, Pic, from China. (Type, *P. magnificus*, Blr.)

*P. magnificus* ♀ is the species figured by Fowler in the 'Fauna of British India,' Introd. fig. 76, p. 172 (see also Pl. XII. fig. 3).

### NEOPYROCHROA, gen. nov.

A new genus seems to be required for the North-American species hitherto placed in *Pyrochroa*. They differ considerably from the European species of this genus, notably in the size of the eyes, which are large and extend nearly to the back of the head, to the almost complete extrusion of any visible genal area between them and the neck.

The type of the genus is *N. flabellata*, Fabr.

The species may be separated as follows:—

- |  |                             |
|--|-----------------------------|
| 1. (4) Head yellow .....   | 2.                          |
| 2. (3) Underside and limbs testaceous; elytra sub-opaque; frontal excavation of ♂ almost closed by hood-like projection of the vertex. (Pl. XII. fig. 4.) .....                    | <i>flabellata</i> , F.      |
| 3. (2) Underside and limbs in greater part piceous; elytra more nitid; eyes more approximate; frontal excavation of ♂ bifoveate, widely open; vertex only slightly prominent ..... | <i>femoralis</i> , Lec.     |
| 4. (1) Head black .....  | <i>*californica</i> , Horn. |

#### HEMIDENDROIDES, Ferr.

This was proposed as a subgenus of *Dendroides*, although its affinity with *Pyrochroa*, as evidenced by the structure of the head and antennæ, is closer than with the American genus. From the description it is probable that *P. davidis*, Fairm., should be placed here.

The species are as follows:—

- |   |                          |
|---|--------------------------|
| 1. (4) Elytra unicolorous, testaceous .....                                   | 2.                       |
| 2. (3) Head and thorax black. (Pl. XII. fig. 5.)....                          | <i>ledererii</i> , Ferr. |
| 3. (2) Head and thorax concolorous with elytra ....                           | <i>peyroni</i> , Reiche. |
| 4. (1) Elytra black, with suture and apex red; head and thorax dark red ..... | <i>*davidis</i> , Fairm. |

#### EUPYROCHROA, gen. nov.

Differs from *Pyrochroa* in its large size and in the conical genæ, which project beyond the eyes. The sides of the prothorax also project strongly just before the base; the elytra are more explanate behind and more distinctly tricostate.

There are only two described species, which may be separated as follows:—

- |  |                             |
|--|-----------------------------|
| Head and thorax shining black; elytra bright red. (Pl. XII. fig. 6.) .....                         | <i>insignita</i> , Fairm.   |
| Head black; thorax and elytra dull red, the former with black spot on disc and black on sides .... | <i>limbaticollis</i> , Pic. |

Of these, the latter was described as a variety of the former; but M. Pic now agrees with me that it is probably a good species.

\* Known to me only from description.

PYROCHROA, Geoffr.

(Type *P. coccinea*, L.)

The species of this genus, in its restricted sense, are as follows:—

- |  |    |                                    |
|--|----|------------------------------------|
| 1. (10) Elytra red .....   | 2. |                                    |
| 2. (5) Head and scutellum black.....                                   | 3. |                                    |
| 3. (4) Form longer; thorax with median furrow .....                    |    | <i>coccinea</i> , L.               |
| 4. (3) Form shorter; thorax without median furrow .....                |    | Var. <i>kabyliana</i> , Pic.       |
| 5. (2) Head wholly or in part red; scutellum red .....                 | 6. |                                    |
| 6. (7) Head completely red .....                                       |    | <i>serraticornis</i> , Scop.       |
|  |    | Var. <i>*tauricola</i> , Pic.      |
| 7. (6) Head partly black .....   | 8. |                                    |
| 8. (9) Upperside bright red, pubescence short and concolorous .....    |    | Var. <i>kiesenwetteri</i> , Fairm. |
| 9. (8) Upperside reddish fulvous, pubescence longer and more golden .. |    | <i>pubescens</i> , Pic.            |
|  |    | (?) <i>*subcostulata</i> , Fairm.  |
| 10. (1) Elytra blue .....  |    | <i>cyanipennis</i> , Pic.          |

SCHIZOTUS, Newm.

(= *Pyrochroella*, Reitt.)

This genus, like *Dendroides*, has been completely misunderstood by European authors. The type of the genus is the North-American *S. cervicalis*, Newm. The Old-World species placed here by Lewis and Pic will be considered under *Pseudopyrochroa*.

Reitter has recently ('Fauna Germanica,' iii. p. 385) proposed the name *Pyrochroella* for certain northern species allied to *P. pectinicornis*, L.; but I do not see that these differ generically from *Schizotus*, Newm. Including these, then, the genus may be tabulated as follows:—

- |  |    |                                 |
|--|----|---------------------------------|
| 1. (2) Elytra blackish, bordered with fulvous.<br>(N. America.) (Pl. XII. fig. 7.).... |    | <i>cervicalis</i> , Newm.       |
| 2. (1) Elytra fulvous. (N. Europe and Asia.)<br>( <i>Pyrochroella</i> , Reitt.) .....  | 3. |                                 |
| 3. (4) Thorax black, margin suffused with red .  |    | <i>fuscicollis</i> , Mann.      |
|  |    | Var. <i>*punctus</i> , Mots.    |
| 4. (3) Thorax red, with or without black spot on disc .....                            | 5. |                                 |
| 5. (6) Thorax with black spot on disc; scutellum fuscous .....                         |    | <i>pectinicornis</i> , L.       |
| 6. (5) Thorax immaculate; scutellum fulvous..  | 7. |                                 |
| 7. (8) Head black, with red spot on face .....   |    | <i>cardinalis</i> , Mann.       |
| 8. (7) Head black, without red spot .....  |    | Var. <i>innotaticeps</i> , Pic. |

\* Known to me only from description.

## PSEUDOPYROCHROA, Pic.

This genus was proposed by Pic for the reception of some of the Eastern species of *Pyrochroa* with small heads narrowed behind the eyes. The type may be taken as *P. deplanata*, Pic. Certain other species Pic at first referred to *Schizotus*, Newm., but later ('Mélanges Exotico-Entomologiques,' fasc. 8, 1913, p. 2) stated that he had been mistaken in this genus, and that all were probably referable to *Pseudopyrochroa*. With this opinion I quite concur; also, the Japanese species referred by Lewis to *Schizotus* should for the present be retained, with his Japanese *Pyrochroa*, in *Pseudopyrochroa*, Pic.

The genus, however, as here adopted, is by no means homogeneous, and lends itself well to further subdivision upon the characters afforded by the head and antennæ, particularly in the male sex. Unfortunately, so many of the species are yet known from one sex only that a complete subdivision on these lines is for the present impossible. From the point of view of practical utility, I have found colour the most satisfactory basis for tabulation, but the present attempt is intended merely as a temporary measure, in the hope of stimulating further study of the genus, and so, by helping to fill up some of the more vital gaps in our knowledge of it, preparing the way for a more scientific classification at some future date. It is probable that in the Oriental species the colours are liable to very considerable variation, and that as longer series become available for study (many of the species have been described upon unique specimens) many so-called species will have to be sunk as mere colour-varieties.

The term "striped," as applied to the elytra, may, perhaps, require explanation. Various authors use the term "costate" for the same effect; but, though true costæ may, in some cases at any rate, be present, the effect is produced by the pubescence sloping in different directions in alternate longitudinal bands, very much like the grass in a lawn that has been recently rolled.

The term "serrate pectinate," as applied to the antennæ, means that there is a double series of pectinations—an upper inner series, usually short and stout, and a lower series of long slender branches (e. g., *P. diversicornis*, Blr., Pl. XII. fig. 10, in which the serrations are unusually well developed). This means that each of the joints concerned is produced at its apex into two distinct branches, one short and stout, the other long and slender. A somewhat similar appearance is sometimes produced by an antenna like that of *P. dimidiata*,

Blr. (Pl. XII. fig. 8 a), in which the joints are strongly expanded, but the fine branch arises from the apex of the expansion.

Those species of which the ♀ only has been described or is known to me are indicated in the following table:—

*Table of Species.*

|     |   |                              |
|-----|---|------------------------------|
| 1.  | (76) Elytra unicolorous, red or black ..  | 2.                           |
| 2.  | (65) Elytra red .....   | 3.                           |
| 3.  | (42) Thorax red .....   | 4.                           |
| 4.  | (5) Antennæ of ♂ with branches lamellate .....  | <i>antennalis</i> , Blr.     |
| 5.  | (4) Antennæ of ♂ with branches of normal form.....  | 6.                           |
| 6.  | (9) Head short and broad; genæ well rounded, subrectangular behind eyes .....   | 7.                           |
| 7.  | (8) Size larger (12-16 mm.). Head of ♂ with deep transverse impression between eyes .....   | <i>harmandi</i> , Pic.       |
| 8.  | (7) Size smaller (8-9 mm.). Head of ♂ with broad but distinct frontal impression almost divided by a carina from the middle of its anterior border..... | <i>rubricollis</i> , Lew.    |
| 9.  | (6) Head more elongate; genæ receding, arcuate between eyes and neck .....  | 10.                          |
| 10. | (11) Vertex of head in ♂ forming strong prominence .....  | * <i>facialis</i> , Fairm.   |
| 11. | (10) Vertex of head in ♂ not produced upwards .....   | 12.                          |
| 12. | (33) Thorax widest before base, more or less sinuate at sides, becoming narrower towards apex .....   | 13.                          |
| 13. | (24) Thorax subangulate before base ..  | 14.                          |
| 14. | (15) Legs clear red .....   | ♀ <i>rufipes</i> , Blr.      |
| 15. | (14) Legs black or piceous.....   | 16.                          |
| 16. | (21) Scutellum fuscous .....  | 17.                          |
| 17. | (18) Size larger (17-18 mm.) .....  | ♀ <i>deplanata</i> , Pic.    |
| 18. | (17) Size smaller (12-13 mm.) .....   | 19.                          |
| 19. | (20) Head black, red only on neck; antennæ of ♂ serrate-pectinate. (Burma.) (Pl. XII. fig. 10.) ..  | <i>diversicornis</i> , Blr.  |
| 20. | (19) Head fuscous, vertex red. (India.)   | ♀ <i>brevithorax</i> , Pic.  |
| 21. | (16) Scutellum red .....  | 22.                          |
| 22. | (23) Head black; elytra narrow, subparallel, strongly striped; antennæ of ♂ simply pectinate....  | <i>melanocephala</i> , Blr.  |
| 23. | (22) Head red, suffused with black at sides; elytra broader behind, but hardly at all explanate, scarcely striped .....                                 | ♀ <i>nilgiriensis</i> , Blr. |

\* Species marked with an asterisk I know only from description.

24. (13) Thorax rounded at sides before base ..... 25.
25. (26) Scutellum fuscous; tarsi testaceous; antennæ of ♂ serrate-pectinate.. *testaceitarsis*, Pic.  
(Prothorax with black spot ..... Var. *\*notaticollis*, Pic.)
26. (25) Scutellum rufous; tarsi black .... 27.
27. (28) Underside dark piceous, with blue reflections: size larger (16 mm.). ♀ *longa*, Perty.
28. (27) Underside black or piceous: size smaller (12 mm.)..... 29.
29. (30) Antennæ of ♂ serrate-pectinate .. *impressiceps*, Pic.
30. (29) Antennæ of ♂ simply pectinate .. 31.
31. (32) Head of ♂ excavate between eyes; prothorax black beneath. (Perak.) ..... *inapicalis*, Pic.
32. (31) Head of ♂ less deeply impressed between eyes; prothorax mostly red beneath. (Java.) ..... *testaceipennis*, Pic.
33. (12) Thorax more or less evenly rounded at sides; antennæ of ♂ simply pectinate ..... 34.
34. (37) Scutellum fuscous ..... 35.
35. (36) Thorax clear red; head black, that of ♂ with two large subcontiguous foveæ between eyes .... *bifoveata*, Blr.
36. (35) Thorax with indistinct black suffusion; head reddish fuscous, that of ♂ similarly foveate ..... ♂ *donckieri*, Pic.  
? ♀ = *lyciformis*, Pic.
37. (34) Scutellum red ..... 38.
38. (39) Colour dark purplish red ..... *\*velutina*, Fairm.
39. (38) Colour fulvous red; antennæ of ♂ simply pectinate ..... 40.
40. (41) Head in greater part red. (Sikkim.) *cardoni*, Fairm.  
(?) = *rubriceps*, Pic.
41. (40) Head fuscous, red in middle; with feeble transverse impression in ♂. (Formosa.) ..... *fainanensis*, Pic.
42. (3) Thorax black or fuscous ..... 43.
43. (46) Size larger (14 mm. or over)..... 44.
44. (45) Elytra scarcely wider towards apex, not explanate behind. (Borneo.) ♀ *fulvipennis*, Blr.
45. (44) Elytra much wider towards apex, strongly explanate behind. (Japan.) ..... *vestiflua*, Lew.  
? = *\*rufula*, Mots.
46. (43) Size smaller (not more than 12 mm.) 47.
47. (50) Second joint of antennæ large, triangular, half as long as third or longer ..... 48.
48. (49) Second joint of antennæ almost as large as third; elytra purplish, distinctly striped..... *peculiaris*, Lew.
49. (48) Second joint of antennæ only half as long as third; elytra fulvous, scarcely striped ..... *luteraria*, Mots.



50. (47) Second joint of antennæ very small compared with third ..... 51.
51. (62) Head completely black ..... 52.
52. (57) Head of ♂ deeply excavate between eyes ..... 53.
53. (54) Antennæ of ♂ serrate-pectinate. (Yunnan.) ..... *costatijennis*, Pic.
54. (53) Antennæ of ♂ simply pectinate. (Japan.) ..... 55.
55. (56) Frontal excavation of ♂ open, full of yellow hair; vertex transversely elevated ..... *aurita*, Lew.
56. (55) Frontal excavation of ♂ almost closed by forward hood-like depression of vertex, itself concave above ..... *brevitarsis*, Lew.
57. (52) Head of ♂ at most with shallow transverse frontal impression.... 58.
58. (59) Elytra fulvous red. (S. India.) .. *indica*, Pic.
59. (58) Elytra brick-red. (Japan.) ..... 60.
60. (61) Prothorax fully twice as broad as long, completely black, with very strong impressions; head of ♂ with broad but distinct impression almost divided by a carina from the middle of its anterior border ..... *laticollis*, Lew.
61. (60) Prothorax less transverse, its anterior and posterior margins suffused with red; disc more nitid and feebly impressed; head of ♂ with feeble transverse frontal impression, vertex gibbous. .... *gibbifrons*, Lew.
62. (51) Lower part of face yellow ..... 63.
63. (64) Vertex of head in ♂ drawn up into a strong upright prominence, connected with clypeal area by a median keel ..... *japonica*, Heyd.  
(Vertical prominence broader, sub-bifurcate ..... Var. *higonæ*, Lew.)
64. (63) Vertex of head forms low flat projection overhanging the frontal excavation (as in *episcopalis*, Lew.). *flavilabris*, sp. n.
65. (2) Elytra black, at most indistinctly suffused with red at extreme base. 66.
66. (69) Thorax black ..... 67.
67. (68) Lower part of face yellow; elytra with purplish pubescence; head of ♂ with deep transverse excavation, overhung by a forward projection of the vertex; antennæ simply pectinate ..... *episcopalis*, Lew.
68. (67) Head completely black; head of ♂ feebly impressed between eyes; antennæ slender, serrate-pectinate. *nigricolor*, Pic.
69. (66) Thorax red ..... 70.

70. (71) Lower part of face yellow; scutellum black; head and antennæ in ♂ as in *episcopalis*, Lew. (67). *atripennis*, Lew.
71. (70) Head black or suffused with red behind; scutellum red ..... 72.
72. (73) Genæ behind eyes well rounded, subrectangular ..... *sumatrensis*, Pic.
73. (72) Genæ behind eyes receding, feebly rounded ..... 74.
74. (75) Prosternum black ..... *dohertyi*, Pic.
75. (74) Prosternum yellow. (Pl. XII. fig. 9.) *Var. ruficollis*, Blr.
76. (1) Elytra with base red, apex black .. 77.
77. (82) Base only of elytra red ..... 78.
78. (79) Thorax black .. *basalis*, Pic.
79. (78) Thorax red ..... 80.
80. (81) Size larger (15 mm.) ..... *javana*, Pic.  
(Red basal patch on each elytron only half as long as broad ..... *Var. reducta*, Pic.)
81. (80) Size smaller (11 mm.) ..... *fruhstorferi*, Pic.
82. (77) At least basal half of elytra red .. 83.
83. (96) Black of elytra occupying about posterior half ..... 84.
84. (85) Thorax fuscous; junction of black and red on elytra extremely suffused ..... *maculata*, Pic.
85. (84) Thorax red ..... 86.
86. (89) Black of elytra retreats along suture. 87.
87. (88) Antennæ of ♂ simply pectinate .. *theresæ*, Pic.
88. (87) Antennæ of ♂ serrate-pectinate .. *gibbiceps*, Pic.  
= *nebulosa*, Blr.
89. (86) Black of elytra advances along suture ..... 90.
90. (91) Genæ well rounded, subrectangular behind eyes. (Pl. XII. figs. 8, 8 a.) ♂ *rotundicollis*, Pic.  
♀ *dimidiata*, Blr.
91. (90) Genæ receding behind eyes ..... 92.
92. (93) Margin of black forms even curve, concave forwards ..... *\*sulcaticeps*, Pic.
93. (92) Margin of black transverse, dentate. 94.
94. (95) Antennæ more slender; third joint elongate, considerably longer than fourth ..... ♀ *bipartita*, Pic.
95. (94) Antennæ stouter; third joint triangular, scarcely longer than fourth. ♀ *robusticornis*, Pic.
96. (83) Black of elytra confined to apex .. 97.
97. (100) Thorax black or fuscous ..... 98.
98. (99) Elytra contiguous almost to apex; black area transversely and sharply limited. (Borneo.) ..... ♀ *apicipennis*, Blr.
99. (98) Elytra separately rounded at tips; margin of black suffused, running well forward along suture and outer margin. (Perak.) ..... *obscuricollis*, Pic.
100. (97) Thorax red ..... 101.
101. (102) Elytra contiguous almost to apex, margin of black sharp. (Java.).. *apicalis*, Pic.

- |   |                            |
|---|----------------------------|
| 102. (101) Elytra separately rounded at tips,<br>margin of black suffused ..... | 103.                       |
| 103. (104) Legs black .....   | <i>malaccana</i> , Pic.    |
| 104. (103) Legs reddish .....   | <i>kannegieteri</i> , Pic. |

*P. antennalis*, Blr., is remarkably similar in its antennal structure, as well as in colour and general facies, to *Phyllocladus magnificus*, Blr., but the structure of the head and distance apart of the eyes preclude its inclusion in the same genus.

*P. rubricollis*, Lew., is probably only a small colour-variety of *P. laticollis*, Lew. (see below, p. 324).

*P. fascialis*, Fairm.—The type is a ♂ stated to be in Coll. Rothschild, and should be now in Coll. Oberthür. A ♀ so named in Fairmaire's Collection at Paris has the head red, with the eyes small and far apart, and the last joint of the palpi short, suboval. It is probably correctly identified, and appears to be related to a Japanese type like *laticollis*, Lew.

Another specimen, referred to by Pic in Bull. Mus. d'Hist. Nat. 1912, no. 3, p. 143, is of a different species. It is larger, and has the head fuscous, with the eyes larger and not so far apart, and the last joint of the palpi much longer.

*P. deplanata*, Pic.—The two specimens upon which the species was described are certainly very strongly flattened. By the courtesy of M. Pic I have carefully examined them, and am of opinion that this flattening is mechanical in origin. The insects are not in any way crushed, but look as though the pupa or the newly emerged beetle had been subjected to pressure. A third specimen in M. Pic's collection and another in that of Mr. H. E. Andrewes are of quite normal form.

*P. donckieri*, Pic, and *P. lyciformis*, Pic.—I am strongly of opinion that these are but the sexes of one species. The colour is a peculiar tawny, quite unusual in the genus. The elytra of the single *P. lyciformis* have a dark median stripe, which seems to be due, at least in part, to the abrasion of the pubescence, and are rather more explanate than those of the single *P. donckieri*. I may say that M. Pic is so far in agreement with me as to admit a *possible* identity, though, in view of the differences between them (which I consider largely individual), he prefers to keep them distinct.

*P. inapicalis*, Pic.—A ♂ in the Fry Collection at the British Museum (Perak, *Doherty*) has the head transversely impressed between the eyes, with the vertex slightly raised; the front portion of the head between the antennæ is trigibbous, the gibbosities being arranged transversely and encroaching upon the transverse impression. The antennæ are rather stout, the basal joint moderately incrassate, the second joint sharply dentate within; joints 3–10 subequal, expanded, each with a fine branch arising out of the apex of the expansion.

*P. testaceipennis*, Pic, is possibly only a variety of *inapicalis*, Pic. It is smaller and more slenderly built, with the transverse impression of the head in the ♂ less deep, but the structure of the head and antennæ are essentially the same as in *inapicalis*.

*P. brevitarsis*, Lew., was described upon ♀ specimens only, but there are in the Paris Museum 5 ♂♂ and 1 ♀ from near Tokio (*E. Gallois*, 22. iv.–16. v. 09, and *J. Harmand*, 1906) that I have little hesitation in referring to this species.

The head of the ♂ has a deep transverse excavation between the eyes, above the base of the antennæ; this cleft is nearly closed in the middle by the forward projection of the vertex, itself deeply impressed. This impression forms a sharp edge overhanging the transverse cleft, and dies away gradually behind. The lower part of the face below the cleft has two oblique pyriform impressions with their points converging near the middle of the anterior edge of the cleft. The first two joints of the antennæ are incrassate and shining, the rest opaque, the third strongly produced, 4–10 each with a long slender branch. The sculpture of the head approaches very nearly that of *P. aurita*, Lew., in which, however, the vertex is not pressed forward over the transverse excavation. In the latter species, too, the lower part of the face is rough and swollen, and the oblique impressions are much smaller.

*P. laticollis*, Lew.—This species also was described upon ♀ specimens only, but a ♂ in the Paris Museum (Mt. Takao, *E. Gallois*, 18. iv. 09) appears to be conspecific with two ♀♀ from the same locality (23. iv. 11) that I identify with *laticollis*, Lew. The sculpture of the head is that of *rubricollis*, Lew., viz., a very broad and distinct transverse depression occupying the greater part of the front of the head, almost divided by a median carina arising from its anterior

border. The thorax is obscurely red, with reddish pubescence. On comparison of these specimens with the types, and with a ♀ undoubtedly *rubricollis*, Lew., in the British Museum (*Staudinger*, 1898), I consider that the latter is merely a small colour-variety of *laticollis*, Lew.

*P. ligoniae*, Lew., is very doubtfully specifically distinct from *P. japonica*, Heyd.

*P. flavilabris*, sp. n.—The single ♂ specimen was included by Mr. Lewis with *P. aurita*, Lew., which at first sight it resembles. The vertex of the head is, as it were, pressed forwards so as to overhang the transverse excavation, as in *atripennis*, Lew., and *episcopalis*, Lew.; but in *flavilabris* the overhanging edge is rounded in front instead of being truncate. The lower part of the face is yellow, in strong contrast to the black upper part of the head; the palpi and legs are piceous. The thorax is black, with the scutellum and elytra fulvous.

Long.  $8\frac{1}{2}$  mm,

*Hab.* Japan (no exact locality given).

These three species—*atripennis*, Lew., *episcopalis*, Lew., and *flavilabris*, mihi—form one of the most sharply marked natural groups of the genus, closely allied to *japonica*, Heyd.; but it is purely accidental that they have come together in the present scheme of tabulation; *nigricolor*, Pic, belongs to a very different group.

*P. nigricolor*, Pic, is another species described from the ♀ only. A ♂ in the Fry Collection (Perak, *Doherty*) has the head rather feebly impressed between the eyes. The basal joint of the antennæ is elongate, feebly incrassate, the second not dentate within, joints 3–10 expanded, serrate-pectinate, with the branches very long and fine.

*P. ruficollis*, Blr., cannot be maintained as specifically distinct from *dohertyi*, Pic. The red colour at the base of the elytra of the latter is not constant, and the only satisfactory difference appears to be in the prosternum, which is black in *dohertyi* and yellow in *ruficollis*. A ♂ of *ruficollis* in the collection of Mr. G. E. Bryant, from Selabintanah, Java, 2. iv. 09, has the head transversely impressed between the eyes, almost excavate, the posterior ridge with a sharp edge, the anterior rounded, trigibbous. The antennæ have the basal joint strongly incrassate, subpyriform, the second dentate within; joints 3–10 with a long slender branch.

*P. maculata*, Pic.—The structure of the head and antennæ in the ♂ is practically identical with that of *inapicalis*, Pic, and it is quite likely that these are merely colour-varieties of the same species.

*P. rotundicollis*, Pic, ♀, and *P. dimidiata*, Blr., ♂, I believe to be but the sexes of one species.

*P. obscuricollis*, Pic.—The antennæ in the ♂ resemble those of *nigricolor*, Pic (see above, p. 325), but are less slender.

*P. malaccana*, Pic.—A ♂ in the Fry Collection (Perak, *Doherty*) has the head transversely excavate between the eyes, both margins overhanging the excavation in a sharp edge; the cavity is filled with yellow hair. The basal joint of the antennæ is strongly incrassate, the second joint subdentate within; joints 3–10 subequal, expanded, serrate-pectinate.

#### EXPLANATION OF PLATE XII.

- Fig. 1. Dendroides bicolor*, Newm., ♂.  
*Fig. 1 a. Ditto. Head and antenna.*  
*Fig. 2. Pseudodendroides assamensis*, Blr., ♂.  
*Fig. 3. Phyllocladus magnificus*, Blr., ♂. Head and antenna.  
*Fig. 4. Neopyrochroa flabellata*, Fab., ♂. Head and antenna.  
*Fig. 5. Hemidendroides ledereri*, Ferr., ♂. Head and antenna.  
*Fig. 6. Eupyrochroa insignita*, Fairm., ♂. Head and antenna.  
*Fig. 7. Schizotus cervicalis*, Newm., ♂. Head and antenna.  
*Fig. 8. Pseudopyrochroa dimidiata*, Blr., ♂.  
*Fig. 8 a. Ditto. Head and antenna.*  
*Fig. 9. Pseudopyrochroa ruficollis*, Blr., ♂. Head and antenna.  
*Fig. 10. Pseudopyrochroa diversicornis*, Blr., ♂. Head and antenna.

#### XXXIV.—Notes on the *Korrigum*, with a Description of Four new Races. By GILBERT BLAINE.

AN examination of the skins and skulls of this antelope in the B.M. collection, containing a series of forty-three specimens from the greater part of its known geographical range, has enabled me to record the following notes and observations, and to describe four new races occupying certain well-defined areas.

#### *Geographical Distribution.*

The *Korrigum*, with its allied forms, the *Tiang* of the

Sudan region and the Topi of E. Africa, is roughly confined to the tropical zone of Africa from about 15° N. to 10° S. lat., and extends across that continent from Senegal to the E. African coast.

Typically from Bornu, it is the commonest antelope in Senegal and along the Upper Gambia River. It occurs near Timbuctoo and probably throughout the Niger basin, is plentiful on the N.W. shores of L. Chad, and is found in the basin of the Upper Shari River \*. It occurs in N.W. Kordofan, whence it probably extends through Darfu and Wadai to the Niger.

In the Sudan it is plentiful on the Dinder River, and is found along the Blue Nile and Sobat Rivers up to the borders of Abyssinia. It is plentiful on the White Nile, the Zeraf, and the Bahr-el-Ghazal Rivers. In the Bahr-el-Ghazal Province it is the commonest large antelope on the flats that border the great swamps, and is found on the borders of the ironstone country, but does not extend west of Wau.

A specimen shot on the Upper Congo by Major Powell Cotton, and presented by him to the museum at Tervueren, near Brussels, shows that it is also found in that region.

It follows the Nile down to the Albert Nyansa, being found again on the flats S. of the Albert Edward Nyansa. It occurs in great numbers on the N.W. shores of Lake Rudolf. In Uganda it is plentiful in Buddu and Ankoli. It extends through Karamoja round the N. of Mount Elgon, across the Guas'ngiehu Plateau, and on to the Mau Escarpment. Thence to the Sotik Country and along the E. coast of the Victoria Nyansa. It probably spreads over the greater part of German East Africa, and is found as far S. as Ussangu and Lake Rikwa, where it is common. It does not occur south of the Tanganyika Plateau.

In the Zambesi basin it is replaced by the closely allied species *Damaliscus lunatus*, the Sassaby.

A smaller race occurs along the East African coast between the Sabaki and Iuba Rivers. On a recent journey down the Tana River which I made in 1912 I met it first 150 miles from the coast.

### *General Description.*

The Korrigum is a medium-sized antelope standing about 4 feet high at the shoulder. It is symmetrical in outline, sloping a little from the shoulders to the quarters, which are round and well formed.

\* Ernst Schwarz, Ann. & Mag. Nat. Hist. ser. 8, vol. xiii. p. 34 (1914).

The head is rather large, the face concave in profile, with an elongated and slightly tapering muzzle. The limbs are fine and clean. The tail is slender, of medium length, with hair on its upper surface only, and ending in a black tuft about the level of the hocks.

It has bare anteorbital glands, and the female has two mammæ. The calves are coloured dull fawn.

The horns, which are sublyrate in form and strongly but not closely ringed, are stout at their bases, and, rising from the plane of the forehead, curve backwards until their ends form nearly a right angle with the facial plane, the tips being turned slightly inwards and upwards.

The general body-colour is light bay, fading to cinnamon on the belly and inside of the thighs. The legs from the knees to the hoofs are cinnamon. A brownish-black band encircles both fore and hind limbs above knees and hocks respectively, and spreads upwards to form a greyish patch on shoulders and quarters. A blackish-grey blaze extends down the face from between the horns to the muzzle, and there is a triangular black patch on the occiput. The ears are narrow and pointed, tan on the back with blackish tips, and pale buff inside.

The coat, which is composed of short, close, stiff hairs, is very fine and glossy, imparting a sleek blood-like appearance to the animal.

### *Habits.*

The *Korrigum* is one of the fleetest antelopes. In galloping it has beautiful action, flexing both knees and hocks well, and covering the ground in long level strides. In this respect it resembles a racehorse more than any other antelope that I know, and differs from a hartebeeste, which has a stilty gallop, performed with rigidly held limbs, the spring appearing to be given by the fetlocks only.

On the Upper Gambia in the dry season, when the bush-fires have left the ground bare and parched, and the fierce heat of the sun intensifies daily until the breaking of the rains, *Korrigum* pack into large herds, two hundred and upwards running in one troop. They do not then stray farther than 5 or 6 miles from the river, being always found within that radius in the orchard-bush, which smothers every feature of that wide country in an interminable jungle of small trees. They are grazers, and feed at this season on the young green shoots that spring from the burnt grass-stubs in the bush and on the little plains bordering the river, supplementing this scanty diet by digging up bulbs and tubers with their sharply pointed hoofs. They drink at



about 10 A.M. and again before sunset, being partial to the muddy water of stagnant swamps adjacent to the river.

A herd of korrigum seen wandering through the open park-lands of East Africa presents a very striking and beautiful colour-effect. They change from mauve to purple-red and black, against a background of brilliant emerald-green, as the sunlight plays spectrally upon their glossy painted skins.

Being stupid antelopes, they will often dash off in alarm on becoming aware of the approach of a man from a distance, subsequently allowing the same individual to walk within easy rifle-range if he is persistent in following them up.

They are found in the largest numbers in the vicinity of large bodies of water, where alluvial treeless flats merge into wide morasses, or near the shores of some of the great lakes. They inhabit in lesser numbers park-like undulating country and ranges of low grassy hills, often in company with hartebeestes. They also range over the Mau Plateau in British East Africa at a height of 7000 to 8000 feet, though this, I fancy, is an aberration from the usual resort of this species; and, again, in small numbers through the grassy undulating country of N.W. Kordofan.

#### *Native Names.*

Tangkongo (Gambia); Korrigum (Bornu); Tiang (Nile); Imera or Jimela (Uganda, Ugaia, Unyamwesi); Topi (Swahili); Mumwe (Ussangu, German East Africa).

#### *Summary of the different Races of the Korrigum.*

*Damaliscus korrigum*.—Senegal and Bornu.

Colour bright orange-bay, fading to cinnamon on belly and inside thighs. Legs from knees and hocks to hoofs cinnamon, banded above with dark ashy brown, which spreads upwards and fades into narrow reddish-grey patches suffused with an ashy sheen on shoulders and quarters. A blaze of blackish grey speckled with white hairs extends down the face from between the horns to the muzzle only.

Skull with concave frontal profile. Muzzle slender and slightly compressed laterally.

Horns basally thick and compressed laterally, with their ends bent back to form nearly a right angle with the frontal plane of the skull. Average length of adult male horns 24 inches; circumference 10 inches.

*Damaliscus korrigum purpurescens*.—Benue River, N. Nigeria.

Colour light in tone, as in *korrigum*, but the bay evenly

suffused with a pale mauve bloom. An indistinct dusky stripe under the eye terminates in a spot under the ears.

Skull less concave in profile.

Horns as in *korrigum*.

*Damaliscus korrigum tiang*.—Sudan.

Colour reddish bay suffused with a ferruginous-purple bloom. Legs bright cinnamon. Shoulder- and quarter-patches ash-grey, with ferruginous tinge. Facial blaze blackish grey, with ferruginous tinge. In some specimens an indistinct broken band under the eyes terminates in a spot under the ears.

Skull slighter than in *korrigum*, with frontal profile nearly straight.

Horns slenderer and not so markedly recurved. Average length 21 inches ; circumference 9 inches.

*Damaliscus korrigum topi*.—Coastal regions of British East Africa.

Colour darker and richer than in *Tiang*, heavily suffused with a mauve bloom, becoming lighter on belly. Facial blaze blackish grey, with ferruginous tinge, and sprinkled with white hairs. Band below eyes more or less defined.

Skull smallest, with frontal profile straight and muzzle longer in proportion.

Horns cylindrical, shorter and straighter, their ends being only slightly bent back from the plane of the frontal profile. Average length 15 inches ; circumference 8 inches.

*Damaliscus korrigum ugandæ*.—Western Uganda.

Colour maroon carried down to the belly, suffused with an ashy sheen. Legs deep cinnamon banded with blue-black. Shoulder- and quarter-patches larger in area, steel-grey. Facial blaze blue-black. Band under eyes scarcely defined, but spot under ears present.

Skull largest, with muzzle long and heavy. Frontal profile straight.

Horns as in *topi*. Average length 17 inches ; circumference 9 inches.

*Damaliscus korrigum eurus*.—Ussangu, German East Africa.

Colour as in *ugandæ*, but lightening to bright reddish bay in posterior dorsal region. Facial blaze as in *ugandæ*, but with an unbroken blue-black band under the eyes extending to under the ears.

Skull and horns as in *ugandæ*.

Table of comparative Skull-measurements in inches.

|  | Condyle-basal length. | Occiput to nasals. | Orbit to gnathion. | Nasals.          | Supra-orbital width. | Width at maseteric knobs. | Width of muzzle above first pre-molars. | Upper dental series. |
|--|-----------------------|--------------------|--------------------|------------------|----------------------|---------------------------|---|----------------------|
| <i>Danaïscus korrigum</i> . Adult ♂. Gambia.<br>B.M. no. 88. 8. 20. 5 .....  | 15.8                  | 7.14               | 10.12              | 6.6              | 5.12                 | 3.4                       | 2.4                                     | 3.14                 |
| <i>D. k. purpureus</i> . Adult ♂. N. Nigeria.<br>B.M. no. 7. 7. 8. 245 ..... | 15.2                  | 7.6                | 10.7               | 6.7 <sub>2</sub> | 6                    | 3.5                       | 2.7                                     | 3.12                 |
| <i>D. k. tiang</i> . Adult ♂. White Nile. B.M.<br>no. 98. 7. 2. 13 .....     | 15                    | 7.8                | 10.2               | 6.12             | 5.9                  | 3.4                       | 2.5                                     | 3.12                 |
| <i>D. k. topi</i> . Adult ♂. Malindi, B.E.A.<br>B.M. no. 14. 2. 2. 1 .....   | 14.14                 | 6.7                | 10.4               | 7.4              | 5.4                  | ....                      | 2.5                                     | 3.12                 |
| <i>D. k. ugandæ</i> . Adult ♂. S.W. Ankole.<br>B.M. no. 5. 2. 3. 28 .....    | 15.14                 | 7.8                | 11                 | 7.2              | 6.6                  | 3.12                      | 2.9                                     | 3.10                 |
| <i>D. k. eurus</i> . Adult ♂. Ussangu, G.E.A.<br>B.M. no. 5. 2. 2. 18 .....  | 15.14                 | 6.14               | 11.1               | 7.9              | 6.1                  | 3.9                       | 2.8                                     | 3.13                 |
| <i>D. lunatus</i> . Adult ♂ .....  | 15.6                  | 7.9                | 10.10              | 6.5              | 6.4                  | 3.10                      | 2.8                                     | 3.11                 |

This table shows that the several races of *korrigum* separate themselves into two groups, viz. the Western races, inhabiting more or less arid desert-regions (*korrigum*, *purpurescens*, and *tiang*), and the Eastern races, inhabiting mostly fertile well-watered regions (*topi*, *ugandæ*, and *eurus*). The skulls of the Western races can be distinguished by their concave profiles, narrower muzzles, and longer, more re-curved, and laterally compressed horns; those of the Eastern races by their wider skulls, with straighter profiles, longer and wider muzzles with longer nasal bones, and by their shorter, more upright, and cylindrical horns.

The characteristic purple bloom, which is absent in *korrigum*, becomes first apparent in the N. Nigerian race *purpurescens*, and intensifies until it reaches its highest development in the East coast *topi*, while the black eye-band follows an almost similar course, being fully developed in the South-eastern race *eurus*.

I have included the measurements of a Sassaby skull in this table, as it is interesting for comparison. There can be no doubt that this antelope is closely related to the *Korrigum*. The skull is very nearly identical, though rather wider in proportion across the orbits and contracted across the forehead. The tympanic bullæ are rounder and not so prominent and conically ridged as in *korrigum*, and the basi-cranial region is shorter.

In bodily size this antelope is identical with *korrigum*, as also in colour and distribution of the markings, differing only where the greyish patches on the quarters spread along the flanks towards the shoulders, and being lighter on the inside of the thighs, while the legs from knees and hocks downwards to hoofs are a dark tan.

In addition to these races of the *Korrigum* Mr. Lydekker has described *selousi*\* from the Guas'ngishu Plateau in British East Africa, a large form distinguished by having a tan-coloured area round the eyes and muzzle, and *jonesi*†, a light-coloured desert-race from N.W. Kordofan. Herr Ernst Schwarz has described *koba lyra*‡ from a skull from the Upper Shari region, south of Lake Chad, which resembles *tiang* in being narrow, but has thinner horns, with their ends markedly curved upwards and inwards; and Professor Cabrera *phalius*§, with a white facial blaze, from east of Mount

\* Lydekker, 'Field,' 1907, ex. p. 249.

† *Id. ibid.*

‡ Schwarz, Ann. & Mag. Nat. Hist. ser. 8, vol. xiii. p. 34 (1914).

§ Cabrera, Proc. Zool. Soc. 1910, p. 998.

Elgon in British East Africa, a country so prolific in the freakish tendencies of its larger fauna.

None of these races can be considered as referable to Professor Matschie's *jimela*\*, apparently described from a drawing shown him by the widow of the late naturalist explorer Böhm, who met with this antelope in Unyamwesi, south-east of the Victoria Nyansa, as having a black stripe down the fore-legs from knees to hoofs, and as lacking the black band on the inner side of the thighs. Professor Matschie thus distinguishes *jimela* from the typical western *Korrigum*; but in none of the skins throughout the series in the B.M. that I have examined do either of these characters appear. I therefore venture to describe *topi* from the Swahili coastal region as a new subspecies of *korrigum* that has hitherto been overlooked.

### *New Races of the Korrigum.*

#### *Damaliscus korrigum purpurescens*, subsp. n.

Colour light bay suffused with pale mauve bloom, fading to pinkish cinnamon on belly. Legs from knees and hocks to hoofs cinnamon, a dusky spot on the back of each pastern. An ashy-black band above knees and hocks extends upwards into pale ashy-grey patches on shoulders and quarters. An ashy-black blaze extends down face from between horns to muzzle. There is a dusky spot under the ears and an indistinct dusky streak under the eyes running into the facial blaze.

Skull and horns as in *korrigum*.

Measurements in inches:—

Condylar-basal length 15·2; occiput to nasals 7·6; orbit to gnathion 10·7; nasals 6·7; palatal length 8·10; supra-orbital width 6; width at masseteric knobs 3·5; width of muzzle above first premolars 2·7; upper dental series 3·11.

Horns: length 19·8; basal girth 9·6.

*Hab.* N. Nigeria.

*Type.* Adult male (skin and skulls). B.M. no. 7. 7. 8. 245. From Ibi, Benue River, N. Nigeria. Collected and presented by the Alexander-Gosling Expedition.

#### *Damaliscus korrigum topi*, subsp. n.

Colour purplish red, washed all over with greyish-mauve

\* Matschie, SB. Ges. Naturf. Freund. Berl. 1892.

bloom, lighter on belly. Legs from knees and hocks to hoofs cinnamon-brown. The usual contrasting body-markings are present, but show less distinctly, owing to the richness of the bloom which covers the whole skin. Facial blaze ashy black, with ferruginous tinge, and sprinkled with white hairs.

Band under eyes more or less defined.

Skull smaller than in the other races, with nasals longer in proportion.

Horns short and cylindrical, their ends only slightly bent back from the plane of the frontal profile.

Measurements in inches :—

Condyllo-basal length 14·14 ; occiput to nasals 6·7 ; orbit to gnathion 10·4 ; palatal length 8·12 ; nasals 7·4 ; supra-orbital width 5·4 ; width of muzzle above first premolars 2·5 ; upper dental series 3·12.

*Hab.* The coastal region of British East Africa between the Juba and Sabaki Rivers.

*Type.* Adult male (skin and skull). B.M. no. 14. 2. 2. 1. From near Malindi, British East Africa. Collected by Sir F. J. Jackson, C.B., and presented by Messrs. Rowland Ward & Co.

This is the smallest known race of the *Korrigum*. An examination of skins and skulls from several sources has enabled me to establish this species. In the B.M. collection there is a very imperfect series of five specimens ; but a visit to the establishment of Messrs. Rowland Ward, who also kindly presented to the Museum a perfect skin and skull, which I have taken as the type, proves its right to recognition as a separate race.

*Damaliscus korrigum ugandæ*, subsp. n.

Colour maroon, suffused with an ashy sheen, the deep tone being carried down to the belly. Legs from knees and hocks to hoofs deep cinnamon. Leg-bands blue-black. Shoulder- and quarter-patches larger in area, steel-grey. Facial blaze blue-black. Stripe under eyes scarcely defined ; spot under ears present.

Skull larger and more massive than in other races. Profile straight ; muzzle long and wide.

Measurements in inches :—

Condyllo-basal length 16 ; occiput to nasals 7·12 ; orbit to gnathion 11·3 ; nasals 7·5 ; palatal length 9·1 ; supra-orbital width 6 ; width at masseteric knobs 3·11 ; width of muzzle above first premolars 2·9 ; upper dental series 3·13.

Horns : length 16 ; basal girth 9.

*Hab.* Western Uganda.

*Type.* Adult male (skin and skull). B.M. no. 5. 4. 3. 22. From S.W. Ankole, Uganda. Collected and presented by Colonel Delmé-Radcliffe.

This is the largest known race of the *Korrigum*. There is a series of eleven specimens of this subspecies in the B.M. Collection, chiefly from the Nyonki Nile and from S.W. Ankole, and all are remarkably uniform in type.

*Damaliscus korrigum eurus*, subsp. n.

Colour maroon, changing to bright reddish bay in posterior dorsal region. Legs and body-markings as in *ugandæ*. Facial blaze blue-black, with an unbroken band of similar colour extending from the blaze under the eyes to below the ears.

Skull as in *ugandæ*.

Measurements in inches :—

Condyllo-basal length 15·13 ; occiput to nasals 6·15 ; orbit to gnathion 10·15 ; nasals 7·13 ; palatal length 8·15 ; supra-orbital width 6 ; width at masseteric knobs 3·8 ; width of muzzle above first premolars 2·9 ; upper dental series 3·13.

*Hab.* Ussangu, German East Africa.

*Type.* Adult male (skin and skull). B.M. no. 5. 2. 2. 18. From the plains of the Upper Ruaha River. Collected and presented by Sir Alfred Sharpe.

The range of the *Korrigum* is interrupted by the barrier of the Tanganyika Plateau, and this is its most southern race. In the Zambesi basin it is replaced by the *Sassaby* (*Damaliscus lunatus*), a species to which it is closely related.

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XXXV.—*An extinct Hartebeeste from Egypt.*

By GILBERT BLAINE.

*Bubalis bubastis*, sp. n.

An extinct hartebeeste, of which skulls have been found in ancient Egyptian tomb-pits, together with those of domestic animals.

Skull showing affinities both to *lelwel* and *major*, but differing from them in the greater prominence of the supra-orbital ridges and in the peculiar development of the cranial

region. Horn-pedicle narrow, with bulging frontal surface as in *major* (that of *lelwel* being flat), the frontal bones curving laterally outwards to form a wide supraorbital ridge. Cranial region long, its main axis forming a right angle with the frontal plane, differing from both *lelwel* and *major*, in which the angle is obtuse. Surface of basisphenoid and basioccipital very convex, as in *major*, with prominent bony processes at their junction.

Horns like *caama* in their general aspect, differing from *major* and resembling *lelwel* in the greater length from base to the angle, from which the end of the horn is reversed. Viewed from in front they diverge evenly outwards for the basal two-thirds of their length, then rather sharply inwards as far as the upper angle. The ends are bent backwards at a right angle and inwards, so that the tips converge. The space inclosed is thus **V**-shaped, not **U**-shaped as in *major* or **V**-shaped as in *lelwel*. Viewed laterally they show a very slightly concave curve from the base to the upper angle, where they turn abruptly backwards at a right angle, and are behind the frontal plane of the skull. In both *lelwel* and *major* the horns at the upper angle are in advance of the frontal plane.

*Hab.* Egypt.

*Type.* Adult imperfect skull, male. B.M. no. 0.6.4.1, from Abadiyeh, near Kena, Egypt. Presented by the Egypt Research Fund.

Comparative measurements of upper portion of skulls of *Bubalis bubastis*, *lelwel*, and *major* in inches:—

|   | <i>bubastis</i> . | <i>lelwel</i> . | <i>major</i> . |
|---|-------------------|-----------------|----------------|
| Length of horn-pedicle from crown to nasals ..... | 7.11              | 7.6             | 8.8            |
| Width just below horns ....                       | 4.6               | 5               | 5.5            |
| Central width .....                               | 4.2               | 4.8             | 4.8            |
| Supraorbital width .....                          | 5.14              | 5.5             | 5.9            |

There are in the B.M. collection the upper portion of three imperfect skulls, with horns, of this hartebeeste, two from the Fayum and one from Abadiyeh in Upper Egypt, obtained through the agency of Professor Flinders Petrie.

They are all three so uniform in character, and differ so markedly from both *lelwel* and *major* (including *buselaphus*), as to deserve specific title.

Mr. Oldfield Thomas has written the following note on the back of the label of the type-specimen: "From a tomb-pit of the VI. (3000 B.C.) dynasty, re-used in the XVIII. (1500 B.C.), with other skulls of oxen, goats, &c."

A visit to the British Museum at Bloomsbury was only



productive of negative information with regard to the hartebeeste skulls found in the tomb-pits. Professor Budge told me that no dates with reference to the period at which these antelopes existed can be relied upon, as the pits were frequently re-opened. They may have been indigenous to Egypt, or brought up alive from the Sudan and sacrificed at the tombs. No drawings are extant which can be identified with this hartebeeste in particular, although there are several representing antelopes in different forms.

XXXVI.—*Connochoëtes taurinus cooksoni, subsp. n.*

By GILBERT BLAINE.

RESEMBLING *johnstoni*, but without the white chevron across the face.

Colour on sides of face, neck, shoulders, and flanks ash-grey tinged with rufous, the rufous tinge becoming more apparent inferiorly, viz., on sides of face, throat, chest, and lower parts of shoulders. Posterior back, rump, quarters, and tail greyish rufous. Belly rufous. Inside of thighs pale ochraceous. Legs pale ochraceous brown. Neck and flanks with usual brindled markings. Face, chin, dorsal and throat manes black. A black spot on knees and black between forks of hoofs. Tail with large black tuft, and edged laterally with black fringe from root to near tip.

*Hab.* The Loangwa Valley, N.E. Rhodesia.

*Type.* Adult skin, male. B.M. no. 6.5.2.2, from the Loangwa River (E. bank). Collected and presented by H. Cookson, Esq.

This race is nearest to *johnstoni*, from which it differs in being generally lighter and greyer (*johnstoni* being darker and browner), and in having no trace of the white chevron across the face below the eyes.

*Taurinus* is much darker, the general colour being dark greyish brown, which does not change on the sides of face and neck, but only on posterior back and rump, where it is less grey. The legs in *taurinus* are deep seal-brown.

The skins of the gnus from the Loangwa valley in the B.M. collection are larger than those of *taurinus*, and the hoofs also appear to be larger. Unfortunately there are no skulls to compare with *taurinus*.

XXXVII.—*Description of a new Cyprinodont Fish of the Genus Mollienisia from Yucatan.* By C. TATE REGAN, M.A.

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*Mollienisia velifera*, sp. n.

Depth of body  $2\frac{1}{2}$  to 3 in the length, length of head  $3\frac{1}{2}$  to  $3\frac{4}{5}$ . Diameter of eye  $3\frac{1}{2}$  in the length of head, interorbital width 2. 27 scales in a longitudinal series. Dorsal 18–19; base a little longer than distance from end of snout (♀) or  $1\frac{2}{3}$  to twice that distance (♂); longest rays  $\frac{4}{5}$  (♀) or  $1\frac{2}{3}$  to 2 (♂) as long as head. Anal 10. Pectoral as long as head; pelvics reaching origin of anal (♀) or with the second ray produced and as long as the intromittent organ (♂). Caudal rounded (♀) or with the lower angle somewhat produced (♂). Least depth of caudal peduncle a little less than length of head. Olivaceous; 3 or 4 dark bars almost covered by the pectoral fins; back and sides with dark brown longitudinal stripes, broader ones along and narrower ones between the series of scales; series of pearl-like white spots between the stripes, 2 spots on each scale; these markings much more conspicuous in the male. Dorsal fin dark, with numerous pale spots; in males a series of more or less distinct large dark spots in the distal part of the fin; caudal nearly immaculate (♀) or the upper  $\frac{2}{3}$  with dark and pale spots and the lower  $\frac{1}{3}$  plain, black-edged (♂).

Progreso, Yucatan.

Two males (80 and 105 mm.) and a female (92 mm.) presented to the British Museum by Herr J. Paul Arnold.

This beautiful new fish is related to *M. petenensis*, but differs in the larger head, fewer scales, coloration, &c., but especially in the larger dorsal fin, which has more rays than in any other species of the genus, *M. petenensis* and *M. latipinna*, which come next to it, having 14 to 16.

XXXVIII.—*Note on Clementia subdiaphana, Carp.*

By A. J. JUKES-BROWNE, F.R.S., F.G.S.

I DESIRE to make a correction respecting the shell which was described as a new species of *Clementia* in this magazine for July 1913. Dr. Dall, of the U.S. National Museum, has since identified it as the adult form of the shell which was described by Ph. Carpenter in 1865 under the name of *Clementia subdiaphana*.

As a matter of fact, the shell which Carpenter described, but did not figure, was the young of this species and his type only measured three-quarters of an inch in width, with a very thin shell; whereas the adult is over two inches wide and is not particularly thin. It seems also to be very variable in shape, for Dr. Dall has figured a variety of it in the Proc. U.S. Nat. Mus. for 1891, but now admits that this was "an exceptionally rotund specimen," whereas he recognizes that called *C. obliqua* by me as "the more common and elongated type" of *subdiaphana*.

Through the kindness of Mr. MacAndrew I have been able to examine an authentic specimen of *C. subdiaphana*, and am satisfied that Dr. Dall's identification is correct, and that *C. obliqua* must be regarded as a synonym of *C. diaphana*. The published figure, however, will be just as useful as if it were that of a new species, because the typical form of the shell has never before been figured, and Mr. E. A. Smith informs me that the British Museum does not possess an adult specimen of it—only a very small one (5 mm. across), marked as named from the type specimens. No one therefore who referred to this example in the National Collection would imagine that it grew to the size of that figured by me, nor would he suppose it to be the same species.

Lastly, it is evident that the specimens on which I founded the species *C. obliqua* cannot have come from Porto Rico in the Caribbean, but must have been obtained from some place on the western coast of America, where *C. subdiaphana* ranges from Alaska in the north to California in the south. The ticket sold with these specimens must have belonged to some other shell in Mr. Bulow's collection, and must have been misplaced.

Doubt has been thrown on the propriety of referring *C. subdiaphana* to the genus *Clementia*, but the shell really does not differ from the typical species (*C. papyracea*) more than does *C. vatheleti*, which was figured on the same plate. Its chief point of difference is the absence of undulations in the shell, but this is not so marked a difference as the peculiar surface-sculpturing found in *C. granulifera* and *C. tasmanica*, which do seem to me worthy of sectional separation, both on this account and because they both have a large and deep pallial sinus.

It may be found convenient to distinguish *C. subdiaphana* and *C. vatheleti* as a special section of the genus, on account of differences in the animal, but I maintain that they should still be retained within the genus *Clementia*.

XXXIX.—*Descriptions of new Species of Heterocera from New Guinea.* By G. T. BETHUNE-BAKER, F.L.S., F.Z.S.

*Stictoptera arcuata*, sp. n.

♂. Palpi irrorated chestnut-colour, end of second segment ringed with creamy, end segment dark brown; frons ochreous grey; head and collar very deep velvety brown, collar edged and divided in the middle with ochreous; thorax and abdomen grey. Primaries ochreous grey, a subbasal patch of dark brown, edged with whitish internally, subtriangular externally; median area pale brownish; reniform very dark velvety brown, with a prominent, arched, dark velvety brown stripe from it to just above the tornus, the area between this and the pale brown median being pale ochreous grey; termen above the arched stripe pale ochreous, shading darker at the apex; a subapical, dark brown, wedge-shaped costal mark, outside which is a short, ochreous, sharply dentate line; termen with slight interneural dark dashes, a trace of a dentate postmedian line internal to the wedge-shaped costal patch. Secondaries hyaline for the basal two-thirds, dark brown for the terminal third.

Expanse 41 mm.

*Hab.* Mount Kebea, British New Guinea; March and April (*Pratt*).

Type in my collection.

*Parallelia crenulata*, sp. n.

♂. Head and thorax olive-brown, abdomen greyish. Primaries olive-brown, with a subdued almost golden hue in parts; an irregular, oblique, slightly waved, subbasal, fine dark line, ending on the inner margin; a small whitish spot near the end of the cell; an indefinite (internally) lilac band beyond the cell, definitely terminated externally and slightly curved, edging a darker area for the rest of the wing; postmedian line crenulate, fine, sharply oblique on the costa to vein 6, then receding and deeply crenulate to the inner margin; a dark indefinite line from the apex to the tornus, beyond which the termen is lilaceous. Secondaries dark brownish, with a pale indefinite median line, and a short whitish dash at the tornus.

Expanse 58–63 mm.

*Hab.* Ekeikei, British New Guinea; January and February (*Pratt*).

Type in my collection.

*Ericeia pampœila*, sp. n.

♂. Head and collar dull cinnamon-brown, thorax pale creamy greyish, abdomen darker. Both wings pale ochreous grey, with various lines more or less crenulated. Primaries with base slightly mottled; an interrupted, darkish grey, sub-basal line, in the midst of which is the very small orbicular stigma; reniform dull cinnamon, adjoining it is a fine brownish crenulated line; postmedian line fine, crenulated, almost saggitate below the costa; a double crenulated line of darker dull cinnamon-brown, with a pale line between, the outer one being edged externally with creamy and having an irregular, ochreous, vertical, costal dash; apex dull cinnamon, somewhat wedge-shaped; termen darkly dotted. Secondaries similar in general pattern, but the postmedian area consists of a series of more or less crenulate and saggitate lines of cinnamon-brown, edged internally with a dark grey line.

Expanse 54 mm.

*Hab.* Ekeikei, British New Guinea; March and April (*Pratt*).

Type in my collection.

The species will come next to *E. sobria*, Wlk.

*Ericeia rhanteria*, sp. n.

♂ ♀. Head, thorax, abdomen, and both wings dull cinnamon-brown. Both wings with a rough appearance, caused partly by being irrorated finely with dark grey. Primaries with four white points in the reniform stigma, one in each corner; a broadish, indefinite, darkish median stripe, on the external edge of which is a whitish-grey scalloped line from vein 3 to the inner margin; a similarly coloured subapical costal patch, below which is a trace of a dentate subterminal line; termen very finely scalloped with blackish, and with interneural black points. Secondaries with an oblique dark grey median stripe, the rest of the wing being marked as in the primaries, only without any whitish grey at all.

Expanse 52 mm.

*Hab.* Ekeikei (1500 feet); January and February (*Pratt*).

Type in my collection.

*Ericeia spodiaplaca*, sp. n.

♂ ♀. Head, thorax, and both wings pale brownish, finely irrorated with grey. Primaries with two white dots at the end of the cell, touching the lower one is the dark grey

median line, which is angled at the costa; postmedian area very broadly ashen-grey, the upper part of it being less solid than the part on the fold; a series of preterminal blackish points, from each of which a minute fine white dash emanates towards the termen. Secondaries similar to the primaries, but the postmedian ashy area is far from solid, being much interrupted.

Expanse 48-56 mm.

*Hab.* Ekeikei (1500 feet); March and April (*Pratt*).

Type in my collection.

At first sight it might appear that this was only an aberration of the previous species, but I have both forms in both sexes with a series of each, and there are no intermediates, so I have described them as species.

*Ericeia setosipedes*, sp. n.

♂. Head, thorax, abdomen, and both wings pale ashy grey. Primaries with brightish chestnut-coloured marks; a small subbasal spot divided by vein 1 *a*; a large reniform stigma, beyond which most of the postmedian area is suffused with chestnut-colour, indefinite and indistinct lines being apparent in it, whilst its outer edge has a distinct, irregular, pale wavy line therein; beyond this the ground-colour is resumed up to the termen, which has preterminal, dark, interneural points. Secondaries with a dirty ochreous median stripe, finely edged with greyish and again externally with whitish; a small pale rusty spot well above the tornus, beyond which is a pale, scalloped, fine indistinct line; anal portion of the terminal area rather whitish; termen very finely scalloped with dark grey, with the usual interneural dark points. In both wings the pale ashy-grey areas are finely and sparingly irrorated with greyish.

Expanse 60 mm.

*Hab.* Dinawa (4000 feet), May-July; British New Guinea (*Pratt*).

Type in my collection.

This species will come next to *eriphora*.

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XL.—On a new Species of *Myopus* from Central Asia.

By MARTIN A. C. HINTON.

I AM indebted to Mr. Oldfield Thomas for permission to publish the following account of an interesting new species of *Myopus* from Central Asia.

*Myopus saianicus*, sp. n.

*Lemmus obensis*, Thomas, Ann. & Mag. Nat. Hist. (8) ix., April 1912, p. 401 (not of Brants).

*Type*.—An adult male (skull with temporal ridges fused into a salient interorbital crest). B.M. 12. 4. 1. 126. From the Syansk Mountains, 100 miles west of Lake Baikal. Trapped on 12th June, 1910, by Mr. Douglas Carruthers, at a height of 2200 feet, in wet moss.

*External characters*.—In all essential respects the external form is that of the genus. Size about as in *M. morulus*, but with relatively larger head. The general colour is considerably lighter and brighter than in *M. schisticolor*. The rusty mantle is much more extensive than in the Skandinavian species, and agrees exactly with Hollister's description of that of *M. morulus*. As in the two cited species, the ground-colour of the remainder of the body is dark grey or slate, but it is lightened in the present species by silver hairs, which are abundant everywhere, and particularly so on the ventral surface; a few silver hairs also appear through the rusty mantle at one point on the rump. The hands are like the sides in colour; the tail is black and the feet are dark brown (near "sepia") above; the under surfaces of feet and tail are lighter, near "buffy brown."

*Collector's measurements of type*.—Head and body 88 mm.; tail (without terminal hairs) 14\*; hind foot (without claws) 16; ear 13.5.

*Skull and teeth*.—Compared with *M. schisticolor*, the upper incisors are slightly stronger and a little more recurved; in section they make a nearer approach to those of *Lemmus*, in that the outer part of the anterior face of each is wider, while the narrower inner portion is rather sharply bent backwards, so that the wearing surface of each tooth tends to assume the peculiar tubular form which is so characteristic of the upper incisors of *Lemmus*. The cheek-teeth are noticeably larger and broader than those of *M. schisticolor*, but they agree exactly in form. The skull differs from the Skandinavian species most strikingly in its greatly enlarged and globosely inflated auditory bullæ. The rostrum is shallower and longer, with less steeply inclined nasals, and the length of the diastema is a little greater. In correlation with the enlargement of the cheek-teeth and bullæ, the pterygoid fossæ are shortened. The posterior edge of the palate is gently convex centrally, instead of being furnished with a small

\* Given as "21" on label; but this is obviously wrong.

median spinous process. The squamosals approach within 1.1 mm. of each other in the fore part of the brain-case, and the bi-stephanic width is reduced to 3.9 mm.; in an equally old skull of *M. schisticolor* these two dimensions are 2.3 and 4.7 mm. respectively; these differences indicate an increased development of the anterior portions of the temporal muscles which is doubtless correlated with the enlargement of the molars.

*Cranial dimensions.*—Condyllo-basal length 25.8 mm. *ca.*; zygomatic breadth 16.5; interorbital constriction 3.1; mastoid breadth 12.6; length and anterior width of nasals 7.5 and 3; diastema 7.5; cheek-teeth (alveolar) 7.8; palatal depth 9.4; cranial depth 8.3; mandible 16.7; mandibular cheek-teeth (alveolar) 7.3.

*Remarks.*—Middendorff ('Sibirische Reise,' ii. 2, p. 108) long ago suspected that "*Myodes schisticolor*" ranged right across Northern Europe and Asia. He described a specimen from Ajan on the west coast of the Sea of Okhotsk, "which just as completely agrees with Lilljeborg's description and figures as if it had sat as the model." This statement was generally ignored until 1912, when Hollister\* described his *M. morulus*, based upon a specimen which he collected in a nut-pine forest, at an altitude of 6875 feet, near Tapucha, a place in the Altai Mountains 125 miles S.E. of Biisk. This differs from *M. schisticolor* in its darker more blackish coloration; duller and much more extensive rusty mantle; laterally compressed, rounder looped, and rather smaller cheek-teeth; and smaller and much flatter auditory bullæ. In every respect, therefore, save in the character of the mantle, *M. morulus* is very different from the form before me. The latter comes from a point some 600 miles to the east of the type locality of *M. morulus*, and may be regarded as the most highly specialized member of the genus yet discovered; this is proved by the cranial and dental characters, which in several important respects show an advance upon those of *M. schisticolor* in the direction of *Lemmus*, and by the lightening of the colour, which causes the species to present such a strong superficial resemblance to *L. obensis* that when Mr. Thomas cursorily examined the type in the first place he failed to discover its true affinities.

\* Smithsonian Misc. Coll. lx., Nov. 29, 1912, no. 14, p. 1; and Proc. U.S. Nat. Mus. xlv. p. 514 (21st June, 1913).



## XLI.—On various South-American Mammals.

By OLDFIELD THOMAS.

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*Callicebus lucifer*, sp. n.

Like *C. lugens*, Humb. (syn. *amictus*, Geoff.), but the tail chestnut-rufous instead of black. Belly black, not red as in *C. torquatus*.

*Hab.* Eastern Peruvian Amazons. Type from Yahuas, N. of Loreto, about 2° 40' S., 70° 30' W. Alt. 500'.

*Type.* Adult male. B.M. no. 14. 3. 1. 2. Original number 44. Collected 9th August, 1913, by Mr. J. J. Mounsey. Two specimens.

By some accident the synonymies of the yellow-handed titis have got confused in Prof. Elliot's recent great work on the Primates. He calls the red-bellied species *C. torquatus*, putting *C. lugens* and *Saguinus vidua* among its synonyms, while the black-bellied one he terms *amictus*. But a study of the original descriptions of these four animals shows that while *torquatus* is red-bellied, *lugens*, *amictus*, and *vidua* are all black-bellied and are clearly synonymous with each other, *lugens* being the earliest name. Its type-locality is the Upper Orinoco, not Olivença, Solimões, as stated, the latter locality being taken from Spix, whose specimen was probably *C. lucifer*.

Specimens of this group are very rare in collections, and the British Museum only contains six, two of each species, as follows:—

*C. torquatus*.—Adult; Rio Negro; bought in 1842; collector unknown. Head and fore limbs: Ega, Amazon; H. W. Bates.

*C. lugens*.—Young specimen from Maipures, Orinoco, practically a topotype of the species; coll. G. K. Cherrie. Adult specimen; "Guiana" (no doubt incorrect); Sir R. Schomburgk.

*C. lucifer*.—Type and paratype from Yahuas, as above.

*Callimico goeldii*, Thos.

A young specimen of this remarkable monkey has been received at the Para Zoological Gardens from the Rio Xapury, an affluent of the Rio Acre, Upper Rio Purus, and on its death has been sent to me for examination.

This is the first example of *Callimico* of which the locality is known, the two previous examples having both been received at the Para Zoological Gardens without any indication of their original home.

The milk-premolars are still in place, but the characteristic third molar (absent in all marmosets) is visible below the level of the bone.

*On Marmosets allied to Leontocebus devillei.*

We have received from the Para Museum a marmoset from the Upper Rio Purus allied to *L. devillei*, and, on examining our series of this group, I find three species represented—apart altogether from the buffy-headed *fuscicollis*, the chestnut and buffy mantled *illigeri*, *apiculatus*, &c., and the very different *nigricollis*, which is without the dorsal marblings.

Of those which have dark head and mantle and strong dorsal marbling the species may be divided as follows:—

- A. Dark on underside extending only to chest, the whole of belly more or less ferruginous. Dorsal marbling grey, scarcely suffused with buffy. An olive or brownish patch over the knee, in the rufous area. Rufous on tail only quite at its base

- a. Mantle and upper arms obscure rufous or brown.

*L. devillei*, I. Geoff. Syn. *M. leucogenys*, Gray\*.

An adult specimen from Rio Pereue, Peru, and the young type of *leucogenys*.

- b. Mantle and upper arms glossy black, like the feet and tail. A large blackish-brown patch at the point of the knee within the rufous area.

*L. pacator*, sp. n.

*Hab.* Rio Pachitea, Peru. Alt. 150 m.

*Type.* Adult female. B.M. no. 4. 7. 7. 5. Original number 214. Collected 15th Nov., 1903, by Otto Garlepp.

- B. Under surface dark brown to the navel, only the lower belly being rufous. Dorsal marbling suffused with buffy, the light rings on the hairs clear buff. No dark patch on tip of knee, the whole leg rich rufous. Basal three inches of tail more or less mixed with ferruginous.

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\* Most curiously, the prominent and extended white whiskers, such as are present in the type of *leucogenys*, prove to diminish with age, a point which I have not seen noticed before. Thus we have young specimens (4-5 inches in length) of *L. illigeri* and *apiculatus*, each obtained with adults, and each with large and prominent white whiskers, which have practically disappeared when the animal is full-grown. Allowing for this alteration, the type of *leucogenys* would appear to be quite like *devillei*.

c. Mantle and arms glossy blackish brown.

*L. purillus*, sp. n.

Dimensions of the type (in the flesh):—Head and body 180 mm.; tail 295; hind foot 60.

*Hab.* Rio Xapury, Upper Rio Acre, Upper Purus.

*Type.* Adult male. B.M. no. 14. 2. 21. 1. Original number 2. 4. Presented by the authorities of the Goeldi Museum, Para.

*Felis pardalis pusæa*, subsp. n.

A small pale ocelot, from the southern coast-region of Ecuador.

Size decidedly less than in most ocelots. Fur short and fine, hairs of back about 13 mm. in length; hairs from withers to occiput reversed forwards as usual. General ground-colour pale, that of the dorsal area and the centres of the lateral rings buffy (near "warm buff"), finely ticked with black, that of the sides white, nearly pure white, or at least greyish white, while it is more or less buffy in ocelots generally; ground-colour of under surface white throughout. Markings everywhere black, sharply defined, the spots and rings small, the characteristic elongate markings of the sides quite broken up into subcircular rings in one specimen and nearly so in the other. Cheeks white, with black markings, the buffy reduced to a narrow band below the lower white eye-stripe. Limbs clear greyish white, hands and feet finely spotted to the digits. Tail white and black, a little buffy only present proximally above.

Skull small, smooth, rounded, little ridged; without sagittal crest except posteriorly; the temporal crests about half an inch apart. Intertemporal constriction not strongly pinched in. Bullæ large, rounded, more inflated than in the other ocelots available, but this character is so variable in the larger cats, notably in the pumas, that little importance can be attached to it.

Dimensions of two male specimens (the first the type):—

Head and body 725, 715 mm.; tail 300, 330; hind foot 150, 145; ear 50, 60.

Skull: greatest length 132, 124; condylo-basal length 121, 119; zygomatic breadth 81, 80; interorbital breadth 26, 24; intertemporal breadth 32.3, 34; breadth of brain-case 48, 50; mastoid breadth 53, 52.5; palatal length 51, 49; length of  $p^3$  10, 9.7,  $p^4$  16, 15.6.

*Hab.* Guayas, coast-region of Ecuador. Type from Chongon, 15 miles W. of Guayaquil. Alt. 60 m.

*Type.* Adult male. B.M. no. 99.8.1.29. Original number 65. Collected 21st November, 1898, by Perry O. Simons. Two specimens.

Among the bewildering variations of the ocelot group this form, from the dry regions to the west of Guayaquil, stands out by its small size, unridged skull, and pale colour. Its white sides, from cheeks to hips, and white limbs are especially noticeable as compared with ordinary ocelots, in which (apart from the grey northern form) there is always a strong suffusion of buffy in the ground-colour of these parts.

A topotype of Mearns's *Felis æquatorialis* \*, from Paramba, northern coast-region of Ecuador, is quite like ordinary Brazilian ocelots in all the characters that distinguish *F. p. pusæa* from them.

*Felis emiliæ*, sp. n.

*F. guttula* group. Coloration pale, as in tropical open-country cats, such as those of Africa or India—quite unlike other South-American cats.

Size and essential characters as in *F. guttula*, the nape-hairs similarly all directed backwards and the skull of the same elongate shape †. Fur unusually short, close, and harsh, the hairs on the withers only about 10 mm. in length, and those of the hinder back 15–16 mm.; the hair in *F. guttula* is half as long again, and, as in all other South-American spotted cats, of quite a different texture. General colour pale, suggesting one of the pale African cats of the *F. ocreata* group or the Indian *F. ornata* ‡. Ground-colour on nape and fore back near “cinnamon-buff” of Ridgway, elsewhere “pale buff.” Markings essentially as in *F. guttula*, but narrower and more sharply defined; the four main lines down the nape narrow (4 mm.), vivid black, sharply contrasted with the ground-colour between them; a still narrower (1–2 mm.) median line also present. Median dorsal area with the usual linear spots, all very sharply defined. Shoulders and flanks with subcircular ring-shaped spots, whose centres are cinnamon-buff, like the ground-colour of the back. Ground-colour of under surface creamy white, more buffy on the throat, the hairs practically white to their bases, in marked distinction to those of *F. guttula*, which are

\* Proc. U.S. Nat. Mus. xxv. p. 246 (1902).

† Cf. Ann. & Mag. Nat. Hist. (7) xii. p. 234 (1903)

‡ Elliot, Mon. Felidæ, pl. xxxii. (1883).

only whitish at their tips. Black belly-spots small, sharply defined, absent from chest and inguinal region. Limbs dark buffy whitish, the spots small and sharply defined; hands and feet with a number of minute blackish spots on them; smoky brown part of sole restricted to the median area. Tail slender, whitish, its markings less in extent and more sharply defined than in the allied species.

Skull on the whole very like that of *F. guttula*, similarly long and narrow. Forehead rather less convex mesially; posterior nares narrower; bullæ decidedly larger. Anterior premolar markedly smaller, its horizontal diameter about 1.5 mm.;  $p^3$  with a distinct convexity at the middle of its inner border.

Dimensions of the type (measured in the flesh):—

Head and body 494 mm.; tail 303; hind foot 106; ear 52.

Skull: greatest length 94; condylo-basal length 87.5; zygomatic breadth 61; intertemporal constriction 28.5; breadth of brain-case 41; palatal length 35; breadth of posterior palatal tube 10; length of  $p^4$  11.1.

*Hab.* Ipu, Ceará, N.E. Brazil. Alt. 300 m.

*Type.* Adult male. B.M. no. 13. 12. 18. 3. Original number 11. Collected 24th May, 1910, by Fräulein Dr. E. Snethlage. Presented by the authorities of the Goeldi Museum, Para. Two specimens.

This striking cat, which at first sight looks as if it should have come from Africa or India instead of South America, is clearly a representative in the dry country of Ceará of the South Brazilian *F. guttula*, a species which has the usual colour-characteristics of South-American animals.

*F. emiliæ* is readily separable from *F. guttula* by its pale colour, whitish underside, the sharp definition of all its markings, and by the cranial characters above mentioned, although these are but slight and may prove to be variable.

From all other species than *F. guttula* it is distinguished by the group-characters described in my paper on the subject already referred to.

This adds another to the many striking and interesting species that Fräulein Snethlage has been instrumental in discovering, and I have much pleasure in connecting her name with it.

*Felis yaguarondi melantho*, subsp. n.

Like true *yaguarondi*, but larger.

Size, as judged by skull, markedly larger than in Central-American or Argentine jaguarondis. Colour of the normal finely grizzled blackish brown, inclining to sepia on the head and to black on the posterior back. Under surface grizzled brown, the belly with a number of obsolescent blackish spots. Tail and feet like body, the soles black.

Skull larger than in any of the other jaguarondis examined, strongly built, heavily ridged. Bullæ low, little inflated. Upper carnassial with a large protocone in the female, a comparatively small one in the male.

Dimensions of male and female (the first the type), from skins:—

Head and body 830, 780 mm.; tail 540, 535; hind foot 159, 145.

Skull: greatest length 116, 105; condylo-basal length 111, 101; zygomatic breadth 75, 68; nasals (median) 24·3, 20; intertemporal constriction 29, 30; breadth of brain-case 47, 45·5; palatal length 45, 40·5; breadth of posterior palatine tube 14·2, 13; length of  $p^3$  8·4, 8·2,  $p^4$  12·8, 13·1.

*Hab.* Pozuzo, Peru. Alt. 800 m.

*Type.* Adult male. B.M. no. 8. 6. 17. 10. Collected August, 1905, by L. Egg. Two specimens, both fully adult, with basilar suture closed.

The different forms of the jaguarondi seem to be distinguishable by little but size, as their colour varies exceedingly, specimens from the same locality, unquestionably conspecific, often differing widely in their tone of grey, blackish, or rufous. The variation in the development of the protocone of the carnassial is also very striking, and is well shown in the two specimens of the present form, the male having it reduced (as is common in jaguarondis) and the female having quite a large one.

The largest jaguarondi is this one from the Peruvian Andes, the central one from Venezuela to Argentina is intermediate in size, while the Guianan and Eastern Brazilian form, for which the name of *unicolor* is available, is the smallest of all.

*The Generic and Subgeneric Names of S.-American Canidæ.*

The proper application of the various generic and subgeneric names which have been given to S.-American Canidæ has

always been involved in extreme confusion, partly, no doubt, because of the doubtful standing of the groups themselves, but more because of the constantly incorrect determination of the species on which the names are founded.

The chief of these causes of error lies at the door of "*Canis azaræ*, Wied," a name which, though made in honour of Azara, with mention of the latter's *Agouarachay*, was clearly based on a member of the Crabeater group. It has, however, been commonly used for the *Agouarachay* of Paraguay, and from this error much of the confusion has arisen.

Dr. J. A. Allen, in his 'Mammalia of Southern Patagonia'\*, has made a valiant effort to clear up the confusion, but, owing to his not appreciating the various misdeterminations of species that have taken place, his results do not seem to be completely acceptable. I propose, however, to accept as far as possible his selection of the genotypes wherever these are doubtful.

The names *Speothos* (syn. *Icticyon*) for *venaticus* and *Chrysocyon* for *jubatus* are clearly settled, and do not need further reference.

*Dusicyon*, Ham. Smith (1839), contained four species, of which, following Allen, we may accept *Canis antarcticus* as the genotype. On this basis it forms a group distinct from anything on the S.-American continent, and peculiar to the Falkland Islands. Two species, both now extinct, from the West and East Falklands respectively, are contained in it, the second one being described below.

The next name is *Cerdocyon*, Ham. Smith. From the four species included, Dr. Allen selects "*Canis azaræ*, Wied, and *Vulpes magellanicus*, Gray," as being its basis and being congeneric. But this is not the case, for *Canis azaræ*, Wied, is a Crabeater, while *magellanicus* is one of the *Agouarachay* group. I shall return to this name below.

The next is *Lycalopex*, Burm. (1854), and for this Dr. Allen selects *vetulus* as genotype, but, on the ground that *vetulus*, Burmeister, is not the same as *vetulus*, Lund, he renames this group *Eunothocyon*, Matthew's *Nothocyon* having been accidentally rendered unavailable for it, for reasons which he explains.

But whether or not Burmeister and Lund's *vetulus* are specifically different from each other (which, after seeing

\* P. 151 et seqq. (1905).

Lund's types, I do not think to be the case), it is certain that they are congeneric, and therefore the name of *Lycalopex* should stand for the group, antedating *Eunothocyon* by many years.

Next comes *Pseudalopex*, Burmeister (1856), containing *Canis azaræ*, Wied, of Burmeister (really the Agouarachay), *C. griseus*, and *C. magellanicus*, all congeneric, the name being therefore valid for the group.

It is to be noted that this interpretation of *Lycalopex* and *Pseudalopex* is exactly as in Gray's 'Catalogue' of 1869.

Going back now to *Cerdocyon*, Ham. Smith, we find that of the two co-genotypes selected by Dr. Allen, *azaræ*, Wied, and *magellanicus*, Gray, the latter has been removed by Burmeister into *Pseudalopex*, leaving the first and most natural one, *azaræ*, Wied, as the genotype of *Cerdocyon*. This name will therefore stand for the Urabeaters, instead of Dr. Allen's *Carcinocyon*.

As a result, we get the following names for the different groups of S.-American Canidæ:—

|                        |   |
|------------------------|---|
| <i>Chrysocyon</i> .... | <i>jubatus</i> group. Monotypic.  |
| <i>Dusicyon</i> ....   | <i>antarcticus</i> group. Type, <i>antarcticus</i> .                      |
| <i>Cerdocyon</i> ....  | <i>thous</i> group. Type, <i>brasiliensis</i> (syn. <i>azaræ</i> , Wied). |
| <i>Pseudalopex</i> ..  | Agouarachay group. Type, <i>magellanicus</i> .                            |
| <i>Lycalopex</i> ....  | <i>vetulus</i> group. Type, <i>vetulus</i> .                              |
| <i>Speothos</i> .....  | Bush-dogs. Type, <i>venaticus</i> .                                       |

#### *Dusicyon darwini*, sp. n.

The extinct dog of East Falkland Island. Larger and (it is said) darker coloured than *D. antarcticus*, that of the Western Island.

Size, as judged by skull, decidedly larger than in *antarcticus*. General colour of the now faded type rather darker than in a skin of *antarcticus*, the hairs of the back, where perfect, with broader black ends than in the allied species. According to the account quoted below from Darwin, the colour is less red than in that animal, a difference now but doubtfully perceptible on the available skins.

Skull distinctly larger throughout than in *antarcticus*. Interorbital region flatter, the frontals less prominently inflated on each side of the middle line. Muzzle markedly broader.

Hind foot of type (c.) 175 mm.



Measurements of five skulls of the two species (two of these kindly placed at my disposal by the authorities of the Royal College of Surgeons) :—

|  | <i>Dusicyon antarcticus.</i> |                            |                           | <i>D. darwini.</i>                   |                        |
|--|------------------------------|----------------------------|---------------------------|--------------------------------------|------------------------|
|  | (♂)*.<br>R.C.S.<br>635.      | (♂).<br>B.M.<br>69.2.24.3. | ♀.<br>B.M.<br>37.3.15.48. | ♂.<br>B.M.<br>37.3.15.47.<br>(Type.) | (♀).<br>R.C.S.<br>636. |
| Greatest length .....                          | 166                          | 164                        | 158                       | 181                                  | 175                    |
| Condyllo-basal length .....                    | 164                          | 162                        | 155.5                     | (c.) 177                             | 171                    |
| Zygomatic breadth .....                        | 94                           | 91                         | 87                        | 98                                   | ..                     |
| Length of nasals (middle line). ..             | 53                           | 57                         | 51                        | ..                                   | 55                     |
| Interorbital breadth.....                      | 30                           | 28.5                       | 27                        | 36                                   | 33.5                   |
| Breadth of brain-case .....                    | 52.2                         | 51.5                       | 51                        | 54                                   | 53                     |
| Breadth of muzzle .....                        | 28                           | 29                         | 28                        | 35                                   | 31                     |
| Palatal length .....                           | 86                           | 85.6                       | 83                        | 95                                   | 91                     |
| Length of $p^3$ .....                          | 11.2                         | 11                         | 10.3                      | 11.7                                 | 11                     |
| Length of $p^1$ .....                          | 17.2                         | 18                         | 17.5                      | 18.5                                 | 20                     |
| Length of $m^1$ and $m^2$ combined. ..         | 17.3                         | 17.5                       | 18                        | 19.8                                 | 20                     |
| Greatest diameter of extracted<br>canine ..... | 9.7                          | 9.5                        | 8.5                       | 10.7                                 | 9.9                    |

*Hab.* East Falkland Island.

*Type.* Adult male. B.M. no. 37. 3. 15. 47. Collected during the voyages of the 'Adventure' and 'Beagle,' and presented by Sir W. Burnett and Admiral Fitzroy.

It is a matter of extreme interest to find that there are two distinct insular forms of the now extinct "Antarctic Wolf," inhabiting respectively the East and West Falkland Islands.

First, may be quoted Darwin's account, published in the Zoology of the "Voyage of the 'Beagle'" ("Mammalia," p. 10), which already indicated this distinction as long ago as 1838 :—"I was assured by Mr. Low, an intelligent sealer, who has long frequented these islands, that the wolves of West Falkland are invariably smaller and of a redder colour than those from the Eastern island; and this account was corroborated by the officers of the 'Adventure,' employed in surveying the archipelago."

[This asserted difference is explained in Mr. Rupert Vallentin's interesting account of the Falkland fauna† as being due to age; but, as no question of age comes in in the distinction of the skulls—all being fully adult,—we may conclude that the opinion given by Mr. Vallentin's informant was mistaken.]

\* Sex-marks placed in brackets indicate that these are presumed from the size of the canines. A male canine is approximately a millimetre more in diameter than a female one, the measurements being taken at the thickest part of the tooth, when extracted from the skull.

† Mem. Manchester Soc. xlviii. mem. 23, p. 45 (1904).

Now, as the name *antarcticus* has to be fixed on one or other of the two forms in question, I propose to assign it definitely to the smaller one, irrespective of locality. My reason for doing this is that the original description\* "was taken from one brought to England when we possessed those Antarctic spots," and as the chief Englishman who had been about that period to the Falklands and mentioned the animals, Commodore Byron, stayed for the greater part of his time at Port Egmont†, West Falklands, and named a place on its southern shore "Fox Bay," the specimen brought to England was very probably from that island, in which I believe the smaller species to occur. No certainty is possible, but this seems the best choice to make in the circumstances.

That the larger animal was a native of the Eastern and the smaller of the Western Island is indicated, firstly, by Darwin's account, and, secondly, by the localities of the two British Museum specimens having been happily recorded by Dr. Gray in the original Museum register on their arrival.

Against this, however, is to be set the fact that no. 636 of the College of Surgeons, which is the larger form, is said to have been picked up on West Falkland, as recorded by Flower in the Catalogue. But I am inclined to disbelieve this, in the face of the other evidence, especially as the words "East" and "West" are sufficiently alike to have been misread at some stage of the proceedings. Mr. Burne has been good enough to look up Flower's letters of the date, but can only find his original entry "West" in the Catalogue.

Then with regard to sex. It might be suggested that the large specimens were males and the small females—as is, indeed, the case with the two skins available. But, apart from the fact that the difference is vastly greater than the sexual difference between other S.-American Canidæ, we are fortunately able to determine, with fair certainty, the sexes of the skulls from the sizes of the canines. According to my sexing on these lines, as indicated in the table of measurements above, two of the smaller skulls are those of males, exceeding the known female by about the same degree as is usual in the group, while of the larger form R.C.S. no. 636 appears to be a female. If this be correct, we thus have both sexes of both species represented in the series available.

I have thought it suitable to attach to this species the name

\* Pennant, Quadr. (1) i. p. 240 (1781). On this description the name *antarcticus* was given in 1799 by Bechstein (Uebers. vierf. Thiere, i. p. 271), antedating Shaw, to whom the name is generally accredited, by one year.

† Hawkesworth's 'Voyages,' i. p. 48 (1773).

of the greatest of all naturalists, whose connection with its distinction has been related above.

*Cerdocyon mimax*, sp. n.

Externally quite like examples from the same locality of *C. thous brasiliensis*, but the skull and teeth very markedly larger.

Colour quite as in *brasiliensis*. Back of ears blackish, a buffy-brown area round their bases. Feet black, with a slight greyish mixture on the metapodials.

Skull (of a female, as compared with two males) markedly larger in all dimensions. Forehead more convex, the height of the skull distinctly greater. Median area between masseteric fossæ of the usual narrow urn-shape.

Teeth larger throughout. Premolars longer and narrower, the third longer than the second. Carnassial and molars all larger than in *brasiliensis* (see measurements).

Dimensions of the type (measured in the flesh):—

Head and body 755 mm.; tail 305; hind foot 132; ear 75.

Skull: condylo-basal length 147.5; zygomatic breadth 80; nasals on middle line 49; interorbital breadth 29; intertemporal breadth 33; postorbital process to deltoid ridge 69; breadth of brain-case 49.5; palatal length 75.

Teeth (those of a male *brasiliensis* in brackets): diameter of canine on cingulum 6.5 (6.3); horizontal length of  $p^1$  4.6,  $p^2$  7.9 (7.3),  $p^3$  9.5 (7.2),  $p^4$  on outer edge 15.2 (12.3); combined length of  $m^1$  and  $m^2$  21 (18.2); greatest diameter of  $m^1$  14.6 (13.6).

*Hab.* Chapada, Matto Grosso. Alt. 800 m.

*Type.* Adult female. B.M. no. 3. 7. 7. 39. Collected 15th October, 1902, by Alphonse Robert. Presented by Mrs. Percy Sladen.

The uniformity in both external and cranial characters of all the available specimens of *Cerdocyon* from Bahia southwards to Rio Grande do Sul and inland to Matto Grosso is extreme, these representing the names *brasiliensis* (1821), *azaræ* (1826), *guarava* (1839), *melampus* (1843), *melanostomus* (1843), and *riograndensis* (1910). The skulls, whether of male or female, are always within a few millimetres of 138 mm. in condylo-basal length, and the upper carnassial is always about 12.5 mm. on its outer edge.

Furthermore, there is little, if anything, to distinguish this widely-spread Brazilian animal from the true Guianan *thous* (1766), but the available specimens of the latter are so

few that I hesitate for the present to use this name for the Brazilian animal, as better series may bring out some constant distinguishing character. *C. thous* ranges westwards into Venezuela, and it is possible that the Santa Marta *C. aquilus* should be united with it.

At Chapada, Matto Grosso, Mr. Robert obtained three dogs of this group, two of them quite like *brasiliensis*, but the third standing out by its long skull and larger teeth from all the rest; and I see no alternative but to consider this as a special form, like as it is externally to the others. Curiously enough, the same thing happened with *Lycalopex*, for he obtained at Chapada the type of *L. sladeni* as well as examples of *L. vetulus*. Probably the locality being at the edge of the Brazilian plateau, animals from both highlands and lowlands may be collected there.

The skull of *C. mimax* in some respects approaches that of the Amazonian *C. microtis*\*, but the external differences between the two are quite marked.

*Cerdocyon thous lunaris*, subsp. n.

Allied to *C. t. savannarum*, but with even smaller skull and teeth.

External appearance very much as in *savannarum*, the general colour a little darker and less suffused with buffy. Under surface whitish, suffused with buff on the belly; chin black. Hands and feet grizzled grey above, black on palms and soles.

Skull markedly smaller than that of *savannarum*, itself the smallest *Cerdocyon* hitherto described. Brain-case proportionally large, its breadth practically equal to that of *savannarum*. Muzzle narrow and delicate. Teeth conspicuously smaller throughout (see measurements), the difference in the size of *m*<sup>1</sup> particularly noticeable. Canines short and slender.

Dimensions of the type:—

Hind foot 113 mm.

Skull: condylo-basal length 116·5; zygomatic breadth 65·5; nasals on middle line 38; breadth of muzzle outside *p*<sup>1</sup> 17·5; interorbital breadth 23; across postorbital processes 35; intertemporal constriction 30; brain-case, breadth 43; postorbital process to back of deltoid ridge 52; palatal length 59.

Teeth: length of *p*<sup>2</sup> 6·4, *p*<sup>3</sup> 6·4, *p*<sup>4</sup> on outer edge 11; *m*<sup>1</sup> on outer edge 8·8, greatest diameter 11·4; length of lower carnassial 13.

\* I am sufficiently a "one-letterist" to see no reason to alter the name *microtis* because it is antedated by *microtus*.

*Hab.* Moon Mountains, S. of British Guiana.

*Type.* Adult female. B.M. no. 11. 6. 7. 24. Original number 14 a. Presented by F. V. McConnell, Esq.

This little dog is no doubt most nearly allied to its geographical neighbour *C. t. savannarum*, from the Kanuku Mountains, just further north, but is readily distinguishable by its still smaller size. The typical specimens of the two forms are both females, so that the question of sex does not arise. The skull of *savannarum* is 125 mm. in condylo-basal length.

*Pseudalopex culpæus*, *Molina*, and its *Subspecies*.

The large "Culpeo" ranges from Ecuador to the Straits of Magellan with but little change of character. At most, certain forms of it may be distinguished as subspecies.

In the south the skulls tend to get longer, especially in the muzzle, a tendency which is carried, on the average, slightly further in Patagonian and Magellan specimens than in those from Central Chili, the type-locality of *culpæus*. On this account we may, perhaps, provisionally recognize an extreme southern subspecies, *Ps. c. magellanicus*, which gradually passes into *Ps. c. culpæus*.

In Tierra del Fuego the skull-lengthening is carried to an extreme in the very distinct *Ps. lycoides*, Phil.

On the other hand, in the north the skull is shorter, and there is little of the peculiar lengthening of the muzzle found in the extreme south. Specimens from Ecuador, Peru, and Bolivia all agree in the size and shape of their skulls.

Those from Ecuador would be representative of *Ps. c. reissii*, Hilzh.\*, while those from the highlands of Peru and Bolivia differ enough in colour to seem worthy of subspecific distinction:—

*Pseudalopex culpæus andina*, subsp. n.

Similar to *Ps. c. reissii* in skull-characters, but the colour more suffused with buffy above, especially anteriorly, and whiter below.

While in *reissii* the reddish colour of the crown changes abruptly at the occiput to the heavily black-washed grey of the back, the nape being therefore like the latter, in the new form the nape, from the withers forward, is strongly suffused with buffy, and the black tips to the longer hairs are so

\* *Canis (Angusticeps) reissii*, Hilzh. Zool. Anz., April 1906, p. 114. *Speothos riveti*, Troues. C. R. vol. cxliii. p. 1184 (December 1906).

I have examined the type of the latter, and find it to be a young *Pseudalopex*. The subgenus *Microcyon* was based upon it (*t. c.* p. 1186).

reduced that the passage to the rufous is further back and more imperceptible. In *reissii* the terminal part of the underfur is brown, while in *andinus* it is "pinkish buff." Under surface mostly whitish, with but little suffusion of rufous; hairs of throat almost pure white. Chin with an inconspicuous brownish patch, as is the case in all the large *Pseudolopex*, while in the smaller ones it is frequently contrasted black. Ears, crown, and outer sides of limbs rich ferruginous, as usual. Tail with long thick hairs forming a fine brush, "pinkish buff," the patch over gland and tip black.

Dimensions of the type:—

Hind foot 148 mm.

Skull: greatest length 165; condylo-basal length 156; zygomatic breadth 88; nasals, length on middle line 54; interorbital breadth 31; breadth of brain-case 50; palatal length 84; length of  $p^4$  on outer edge 16, combined length of  $m^1$  and  $m^2$  16.8.

*Hab.* High plateau of Bolivia and Peru. Type from Esperanza, near Mt. Sajama, Province of Oruro, Bolivia. Alt. 4000 m. Another example from Incapirca, Junin, Peru. Alt. 17,000' (*J. Kalinowski*).

*Type.* Adult male. B.M. no. 98. 3. 16. 1. Original number 1816. Collected 9th July, 1897, by Gustav Garlepp. Three specimens.

This plateau fox is clearly most nearly allied to the northern *Ps. c. reissii*, with which it shares the normal-shaped skull, not disproportionally elongated in the muzzle, but differs by its more buffy nape and fore-back, the heavy black grizzling not commencing nearly so far forward. The four specimens available are all identical in this respect.

Objection may be taken to my considering as the same species animals from such enormous north and south distances as from N. Ecuador to the Straits of Magellan (nearly 4000 miles). It must, however, be remembered that, owing to the unbroken mountain chain running down S. America, practically similar climatic conditions are to be found without a break throughout the whole distance, only varying with altitude, so that there is nothing unnatural in the animals of the highlands of the tropics, the middle altitudes of Chili, and the lowlands of Patagonia being all specifically the same. A similar state of things does not occur in any other of the great continents of the world.

In Uruguay, however, widely separated from the known range of the Culpeo, there occurs another species which has, as usual, been called "*Canis azaræ*," but proves to be a small relative of the Culpeo, and is equally different from the

Buenos Ayres fox (described below) and the members of the genus *Cerdocyon*. This, as may be gathered from Mr. Aplin's interesting account of the mammals of Uruguay, occurs side by side with the "Agouará," which I identify with Burmeister's *Canis entrerianus* \*.

*Pseudalopex culpæola*, sp. n.

Essentially like *Ps. culpæus*, but very much smaller.

Size approximately as in the Buenos Ayres fox (*Canis azaræ*, Burmeister, nec Wied). Colour about as in that animal, the back mixed black and pale buffy, the nape like the back, though less heavily blackened. Under surface whitish, the throat nearly pure white, the interramia scarcely darkened, and the extreme tip of the chin black, the extent of the black, however, in no way comparable to what occurs in the black-chinned species. Head buffy rufous. Ears, outer sides of limbs, and the hams bright rufous, as in *culpæus*. Tail with the usual black patch over the gland and broad black tuft; the rest of the tail-hairs creamy whitish, with black tips.

Skull very like that of the Buenos Ayres fox †, conspicuously smaller than in *Ps. culpæus*. Forehead very slightly swollen; postorbital processes strongly developed. *P*<sup>4</sup> comparatively smaller.

Hind foot of type 137 mm.; ear 90.

Skull: greatest length 143; condylo-basal length 140; zygomatic breadth 77; nasals 51; interorbital breadth 26·7; breadth of brain-case 46; palatal length 75; *p*<sup>4</sup> on outer edge 13·4; *m*<sup>1</sup> and *m*<sup>2</sup> combined 17.

*Hab.* Soriano, Uruguay. Type from Santa Elena.

*Type.* Adult female. B.M. no. 94. 1. 24. 2. Collected 29th October, 1892, by O. V. Aplin, Esq.

Distinguishable from all forms of the Culpeo by its smaller size and from the Zorro of Buenos Ayres, the *Canis azaræ* auctorum, by its practically white chin, white underside, and ferruginous limbs and hams.

\* Reise La Plata, ii. p. 400 (1861). Burmeister later (Republ. Argent. iii. p. 154, 1879) stated that this species had been founded on a male "*Canis cancrivorus*" and a female "*Canis azaræ*"; but *Cerdocyons* apparently do not occur in this region, and, taking the male as the type, there seems no doubt that *entrerianus* should be identified with Mr. Aplin's Agouará, an animal much more *Cerdocyon*-like than the members of the genus *Pseudalopex*. The female was no doubt the Buenos Ayres fox described below.

† So strong is this resemblance that, in case any mistake has been made in the identification of the skull, I think it advisable to nominate the skin as the type.

Passing now to the Zorro of Buenos Ayres, an animal probably the same as the Agouarachay of Azara, we find that, owing to its having been generally, though erroneously, known as *Canis azaræ*, no tenable name exists for it. All the numerous names put into its synonymy by Burmeister, Mivart, and Trouessart are accounted for elsewhere, and I therefore now give it a new name.

As it has, however, been so long connected with Azara's name, and the word *azaræ* (being synonymous with *brasiliensis*) now disappears altogether, so that no confusion can arise, I propose to apply a term which equally recalls the famous Spanish naturalist who first discovered it.

*Pseudalopex azarica*, sp. n.

*Canis azaræ*, auctorum, nec Wied.

Size much smaller than in the Culpeo. General colour above coarsely grizzled grey. Below mixed brown and grey, the soiled brownish of the postaxillary region differing very noticeably from the white of the corresponding parts of *Ps. culpæus* and its allies. Chin and interramia black; upper part of throat white, lower grey-brown. Inguinal region white. Head buffy, the hairs tipped with whitish. Back of ears buffy brown, an area behind them richer buffy. Fore limbs to elbows and hind to above heels bright tawny or ochraceous, a prominent black patch on the hinder side of the thigh. Rump and hams grizzled greyish like back, not ferruginous.

Skull with fairly flattened frontal region and well-developed widely expanded postorbital processes.

Dimensions of the type (measured in the flesh):—

Head and body 870 mm.; tail 336; hind foot 146; ear 82.

Skull: greatest length 147; condylo-basal length 143.5; zygomatic breadth 78.5; nasals 55; interorbital breadth 30; tip to tip of postorbital processes 42; breadth of brain-case 47; palatal length 73;  $pm^1$  13;  $m^1$  and  $m^2$  combined 17.8.

*Hab.* Province of Buenos Ayres, probably extending northwards to Paraguay. Type from Mar del Plata, S.E. Buenos Ayres.

*Type.* Adult female. B.M. no. 12.2.17.3. Original number 5. Collected 10th August, 1911, and presented by W. A. Smithers, Esq.

As shown by Burmeister, this species differs from its nearest ally, the "Chilla" of Chili, by its larger size and the more broadly expanded frontal region of the skull.

Besides a series from Mar del Plata, the Museum contains



some young specimens from Ajo, an adult from Esperanza, near Parana, and a skull from Peru station, N.W. of Bahia Blanca. The species no doubt occurs commonly all over the Pampas region as far north as Paraguay.

A more jackal-like form of this black-chinned group occurs in Peru:—

*Pseudalopex inca*, sp. n.

Coarser-haired than *Ps. azarica*, colour more drabby.  $Pm^4$  much larger.

Size of skull somewhat larger than in *Ps. azarica*, though the flesh-dimensions are less. Fur coarser and harsher. General colour less strikingly contrasted black and whitish, more drabby brown, the light part of the hairs and the light shoulder-patches near "wood-brown." Under surface mixed drabby brown and whitish, the chin black, the middle line of throat, chest, and belly white, broken by a transverse bar of drabby brown on the chest. Head grizzled brown and whitish. Ears and postaural patch dull tawny brown. Outer side of limbs dull tawny, a marked black patch on the back of the thigh.

Skull rather larger and heavier than that of *Ps. azarica*, but the postorbital processes less expanded; upper carnassial large and heavy, more as in the *Ps. culpæus* group.

Dimensions in the flesh:—

Head and body 640 mm.; tail 320; hind foot 138; ear 98.

Skull: greatest length 155; condylo-basal length 148; zygomatic breadth 82.5; nasals 54; interorbital breadth 27; tip to tip of postorbital processes 34.7; breadth of brain-case 49; palatal length 79;  $p^4$  on outer edge 15.8;  $m^1$  and  $m^2$  combined 16.3.

*Hab.* Sumbay, Arequipa, Peru. Alt. 4000 m.

*Type.* Adult female. B.M. no. 0.10.1.1. Original number 1048. Collected 7th June, 1900, by Perry O. Simons. Presented by Oldfield Thomas.

This striking jackal-like dog, by its heavy dentition and especially its large carnassial, might have been thought to belong to the *culpæus* group, but the highly characteristic external markings, the black chin, black thigh-patch, and brownish (instead of reddish) rump and hams show conclusively that it is more allied to Azara's fox, the Chilla, and their allies. It is, however, readily distinguished from any of them by its coarse hair, duller colour, and large teeth.

No member of the group has hitherto been recorded from

Peru, Tschudi's "*Canis azaræ*" having been no doubt *Pseudalopex culpæus andina*.

*Potos flavus mansuetus*, subsp. n.

Colour paler and greyer than in other subspecies, the general tone being near Ridgway's "drab," while the allied forms are all some shade between "cinnamon-buff" and pale "clay-colour." Under surface creamy buff. Ears large, their backs blackish brown. Dark dorsal streak broad, not sharply defined. Feet buffy, soles with the hairy portion proportionally long, the distance from the naked part to the back of the heel about 28 mm. Tail long, drabby above, dull buff below, the end strongly darkened.

Teeth unusually small, as in *P. f. modestus*.

Dimensions of the type (measured in flesh):—

Head and body 387 mm.; tail 412; hind foot 89; ear 36.

Skull: greatest length 86; interorbital breadth 17.5; palatal length 37; front of canine to back of  $m^2$  23; combined length of molariform teeth ( $p^4$ ,  $m^1$ ,  $m^2$ ) 11.8; breadth of  $m^1$  4.7.

*Hab.* S. Domingo, W. of Quito, Ecuador. Alt. 1760 feet.

*Type.* Young adult male. B.M. no. 13. 10. 2. 19. Original number 33. Collected 18th April, 1913, by Gilbert Hammond. Presented by Oldfield Thomas.

This kinkajou is allied by its small teeth to the *P. f. modestus* of S.W. Ecuador, but differs by its more drabby-grey colour and more hairy feet, that animal being fully as strongly coloured as the other subspecies, and having the naked part of the sole approaching within about 16 mm. of the heel.

*Sciurus cuscinus ochrescens*, subsp. n.

Like true *cuscinus*, but the yellowish of the under surface stronger and more ochraceous in tone, varying from "ochraceous buff" to "ochraceous orange" of Ridgway, as compared with the "antimony yellow" of the typical form.

Dimensions of the type (measured in flesh):—

Head and body 180 mm.; tail 170; hind foot 45; ear 25.

Skull: greatest length 48; upper molar series 7.8.

*Hab.* Bolivia, in upper parts of Beni and Mamoré Rivers. Type from Astillero, 67° W., 16° S. Alt. 2700 m.

*Type.* Adult female. B.M. no. 1. 6. 7. 30. Original number 1282. Collected 23rd November, 1900, by P. O. Simons. Presented by Oldfield Thomas. About twenty specimens examined.

True *S. cuscinus* occurs in the upper parts of the Ucayali and Madre de Dios Rivers, considerably further to the north-west than this Bolivian representative of the species. The general colour of the under surface is on the average markedly more ochraceous in the south-eastern form.

## PROCEEDINGS OF LEARNED SOCIETIES.

### GEOLOGICAL SOCIETY.

August 8th, 1913.—Dr. Aubrey Strahan, F.R.S., President,  
in the Chair.

The following communication was read:—

‘The Miocene Beds of the Victoria Nyanza and the Geology of the Country between the Lake and the Kisii Highlands.’ By Felix Oswald, D.Sc., B.A., F.G.S.; with Appendices on the Vertebrate Remains, by Charles William Andrews, D.Sc., F.R.S.; on the Non-Marine Mollusca, by Richard Bullen Newton, F.G.S.; and on the Plant-Remains, by Miss N. Bancroft, B.Sc., F.L.S.

The Miocene beds of the eastern coast of the Victoria Nyanza, south-east of Karungu, form a narrow zone (covered with black earth) at the foot of cliffs of overlying nepheline-basalt, and are only exposed in a few gullies. The whole series is conformable, dipping 8° north by west.

1. (Beds 1–12.) An upper group (about 70 feet thick) of grey and brown clays and shales, with occasional current-bedded sandstones containing terrestrial shells (*Tropidophora*, *Cerastus*), as also calcified tree-stems in the uppermost bed.

2. (Beds 13–25.) A middle group (about 30 feet thick) of red and grey clays, with white sandstones in the lower half. No bone-bed, but fragmentary Chelonian and Crocodilian remains occur sparsely throughout the series. Persistent horizons are a travertine marlstone (No. 14) containing *Ampullaria* and *Lanistes*; a thin sandstone (No. 16) yielding Hyracoid jawbones; and a gravel (No. 24) yielding teeth of *Dinotherium*, *Protopterus*, crocodile, etc.

3. (Beds 26–37.) A lower group (about 35 feet thick) of current-bedded sandstones and gravels passing down into clays and marlstones. A conglomerate of calcareous nodules overlies gravelly sandstones (No. 31) containing isolated bones of *Dinotherium*, *Anthracothers*, rhinoceros, giant tortoises, etc., indicating a Lower Miocene (Burdigalian) age, with *Ampullaria*, *Cleopatra*, and terrestrial shells (*Cerastus*).

These fluviatile sediments were deposited in a lagoon, and were derived from gneisses, andesites, and quartzites that still occur *in situ* to the eastward. Calcareous springs acted intermittently, and the sediments became finer and less fossiliferous as the river-system reached its base-level.

The series overlies gneisses and amphibolites (with a north-north-westerly and south-south-easterly strike). In searching for the extension of these beds the Author found them to be completely denuded on the south, while on the north they disappear beneath the basalt-plateau. Marching up the Kuja Valley, he found the upper beds lying on old andesite 15 miles inland, on the line of strike. Evidence is adduced of the lake having stood about 330 feet above its present level, and of a rejuvenation of the rivers since the formation of a gneissic peneplain, above which the Kisii Highlands rise in steep escarpments of ripple-marked, unfossiliferous, quartzitic sandstones (probably Devonian), separated from the underlying gneisses and schists by an extensive dolerite-sill. From Kisii the peneplain was traversed to the region of nepheline-lavas near Homa Bay. Lake Simbi, an explosion-crater, was investigated; and a Pliocene series was found north of Homa Mountain.

The vertebrate remains described by Dr. C. W. Andrews include Proboscidea, Hyracoidea, Artiodactyla, Rodentia, and Reptilia, and fully support the suggested occurrence of Lower Miocene deposits on the shores of the Victoria Nyanza. A deposit of probably Pliocene age yielded a new (?) species of *Elephas*, also bones of antelopes and baboons.

The non-marine mollusca associated with the Miocene vertebrates are freshwater and terrestrial shells which all belong to existing species. Only *Ampullaria*, however, still occurs in the Victoria Nyanza, while *Lanistes carinatus* is not found nearer than the Tana River, and the nearest recorded locality for *Cleopatra bulimoides* is in the Lake Rudolf region and Mombasa. Among the terrestrial shells, *Burtoa* is the sole genus occurring near the Victoria Nyanza; the other forms (*Cerastus*, *Tropidophora*, *Achatina*) are found at considerable distances therefrom. The total absence of Pelecypoda is also interesting.

## MISCELLANEOUS.

*C. W. Hahn and C. L. Koch, 'Die Arachniden,' 1831-1848.*

*To the Editors of the 'Annals and Magazine of Natural History.'*

GENTLEMEN,—I shall be obliged if anyone can tell me of the existence of a copy of the above in the original wrappers, or furnish me with the dates of publication of the parts. I know the contents of each part.

C. DAVIES SHERBORN.

Brit. Mus. (Nat. Hist.),  
London, S.W.

*On the Contents of the Parts and Dates of Publication of C. W. Hahn and G. A. W. Herrich-Schaeffer, 'Die Wanzigartigen Insecten,' 1831-1853.* By C. DAVIES SHERBORN.

(Published by permission of the Trustees of the British Museum.)

A FINE complete copy of this book is in the British Museum (Natural History) with all the original wrappers intact; and, although it is not likely to suffer from the ignorance of the binder, it seems desirable to put the information as to contents and dates on record for the use of other workers. There are nine volumes: eight had six parts each, and the ninth nine parts.

|         |           |             |          |                  |   |
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| I. 1.   | Pp. 1-36. | Feb. 1831.  | VI. 1.   | Pp. 1-20.        | Sept. 1840.   |
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| 3.      | -80.      | May 1834.   | 3.       | -60.             | Jan. 1844.  |
| 4.      | -100.     | July 1834.  | 4.       | -80.             | Apr. 1844.  |
| 5.      | -120.     | Oct. 1834.  | 5.       | -104.            | May 1844.   |
| 6.      | -142.     | Mar. 1835.  | 6.       | -134.*           | Nov. 1844.  |
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| 3.      | -58.      | Feb. 1836.  | 3.       | -68.             | Jan. 1846.  |
| 4.      | -74.      | July 1836.  | 4.       | -84.             | June 1846.  |
| 5.      | -90.      | July 1836.  | 5.       | -100.            | Oct. 1846.  |
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| IV. 1.  | 1-16.     | May 1837.   | IX. 1.   | 1-44.            | Oct. 1849.  |
| 2.      | -32.      | Nov. 1837.  | 2.       | -96.             | } Sept. 1850.   |
| 3.      | -64.      | Apr. 1838.  | 3.       | -144.            |   |
| 4.      | -80.      | Apr. 1838.  | 4.       | -192.            |   |
| 5.      | -92.      | Sept. 1838. | 5.       | -256.            |   |
| 6.      | -108.     | May 1839.   | 6.       | -348.            | Nov. 1851.  |
| V. 1.   | 1-16.     | May 1839.   | 7.       | 6 pls. ?         | { 1-31 (Literature) } 1853.<br>& 1-104 (Index). ? 1853. |
| 2.      | -40.      | July 1839.  | 8.       |                  |   |
| 3.      | -60.      | Sept. 1839. | 9.       | 105-210 (Index). |   |
| 4.      | -72.      | Jan. 1840.  |          |                  |   |
| 5.      | -88.      | Jan. 1840.  |          |                  |   |
| 6.      | -108.     | Apr. 1840.  |          |                  |   |

*An Attempt at a Fixation of the Dates of Issue of the Parts of the Publications of the Musée d'Histoire Naturelle of Paris, 1802-1850.* By C. DAVIES SHERBORN.

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The following table is the result of three weeks' hunt through various records, printed and manuscript, and is offered as an approximation to the truth. It seems to me that the time has now most certainly come for academies, societies, and institutions publishing papers on Natural History to furnish to the world a

\* On signatures 10 and 11 the Volume is misprinted "XI."

complete and authentic record of the contents of the parts of their publications and their date of issue. Some have already done so. It is surely more easy for those in charge, who have their records at hand, to issue such a list than it is for one who has to depend on publishers' lists or records or "accession books." Moreover, it is a serious expenditure of time for one like myself, who is thus greatly hampered in attempts to do work the whole value of which depends on accuracy of date. The year is useless in most questions of nomenclature, the month is also wanted. I shall be grateful for notice of any errors in this table, that I may be able to correct my slips for the "Index Animalium," if necessary.

*Annales du Muséum National d'Histoire Naturelle*  
(with Vol. VI. the word "National" disappears).

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|      | 3.  | -256.     |                       |       |     | 45.       |                   |                  |
|      | 4.  | -312.     |                       |       |     | 46.       |                   |                  |
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|      | 33. | -228.     | June "                |       | 75. | -240.     |                   |                  |
|      | 34. | -324.     | Aug. "                |       | 76. | -312.     |                   |                  |
|      | 35. | -396.     | Sept. "               |       | 77. | -400.     | June "            |                  |
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|      | 39. | -248.     | ? Feb. 1806.          |       | 81. | -228.     |                   |                  |
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| 101. }                  | } Aug. "                       | 119.        | -392.      | Jan. 1814.            |
| 102. }                  |                                | 120.        | -488.      | Inter Feb.-Oct. 1814. |

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| 8. -220.        |                      | -238.       | } Out by Sept. 1822. |
| 9. }            | } Out by Sept. 1816. |             |                      |
| 10. }           |                      | -490.       | } Oct. 1822.         |
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|                 | } Out by June 1818.  | -484.       | " "                  |
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|                 |                      | -240.       | Mar. 1825.           |
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|                 |                      | -396.       | Sept. "              |
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| -488.           |                      | -256.       |                      |
|                 |                      | -348.       |                      |
|                 |                      | -448.       |                      |
|                 |                      | -556.       |                      |

\* I do not know whether these were issued in six parts to one volume, as the records only show two dates of issue for Vols. III.-VIII.

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|       | -140.     | Feb. 1826. |        | -168.     | } 1829.        |
|       | -204.     | Mar. "     |        | -232.     |                |
|       | -296.     | June "     |        | -312.     |                |
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|       | -464.     | Dec. "     |        | -472.     |                |
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|       | -172.     | } June "   |        | -160.     | } 1830.        |
|       | -252.     |            |        | -224.     |                |
|       | -344.     |            |        | -312.     |                |
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|       | -256.     |            |        | .....     |                |
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|       | -408.     | Feb. 1828. |        | .....     |                |
|       | -488.     | July "     |        | -468.     | } ? 1832.      |
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|       | -472.     | Oct. "     |        | -370.     |                |

Continued as:—

*Nouvelles Annales du Muséum d'Histoire Naturelle*  
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|     | 2. | -320.      | 1832.                  |      | 2. | -216.      | Ante Mar. 1835.      |
|     | 3. | -408.      | 1832.                  |      | 3. | -320.      | "                    |
|     | 4. | -478.      | Early in 1833.         |      | 4. | -516.      | Apr. 1835.           |
| II. | 1. | 1-148.     | Middle of 1833.        | IV.  | 1. | 1-96.      | July 1835.           |
|     | 2. | -268.      | Third quarter of 1833. |      | 2. | -232.      | Oct. "               |
|     | 3. | -368.      | End of 1833.           |      | 3. | -296.      | Oct. "               |
|     | 4. | -512.      | Ante Aug. 1834.        |      | 4. | -436.      | Apr. 1836.           |

Continued as:—

*Archives du Muséum d'Histoire Naturelle.*

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|      | 2. | -242.      | Post Mar. 1839.          |     | 2. | -240.              | 1844.            |
|      | 3. | -382.      | ? 1839.                  |     | 3. | -344.              | Ante May 1849.   |
|      | 4. | -464.      | ? 1840.                  |     | 4. | -428.              | Ante Sept. 1850. |
| II.  | 1. | 1-88?      | ? 1840.                  | V.  | 1. | } Ante June 1851.  | 1851.            |
|      | 2. | -232.      | } Post Oct. 1841.        |     | 2. |                    |                  |
|      | 3. | -306.      |                          |     | 3. |                    |                  |
|      | 4. | -460.      | Mid Dec. 1842.           |     | 4. | } Ante Sept. 1851. | 1851.            |
|      | 5. | -594.      | Me judice early in 1843. | VI. | 1. |                    |                  |
| III. | 1. |            | Mar. 1843.               |     | 2. |                    |                  |
|      | 2. |            | " "                      |     | 3. | } No data.         |                  |
|      | 3. |            | Ante Sept. 1843.         |     | 4. |                    |                  |
|      | 4. | ? 393-616. | Mar. 1844.               |     |    |                    |                  |



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AND

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(ZOOLOGICAL DEPARTMENT, BRITISH MUSEUM).

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BEING A CONTINUATION OF THE "ANNALS" COMBINED WITH  
MESSRS. LOUDON AND CHARLESWORTH'S "MAGAZINE OF NATURAL HISTORY."

WITH SIX PLATES.

Illustrative of Dr. T. Scott's Paper on some Copepoda from the Falkland Islands,  
Dr. C. Chilton's on the Species of *Limnoria*, and Mr. G. B. Sowerby's on new  
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# THE ANNALS

AND

## MAGAZINE OF NATURAL HISTORY.

[EIGHTH SERIES.]

No. 76. APRIL 1914.



XLII.—*Remarks on some Copepoda from the Falkland Islands collected by Mr. Rupert Vallentin, F.L.S.* By THOMAS SCOTT, LL.D., F.L.S.

[Plates XIII.—XVI.]

In a previous paper\* on Copepoda obtained in collections made by Mr. Rupert Vallentin at the Falkland Islands in 1909, 1910, and 1911, the species which were dealt with belonged to the first and third divisions of Professor G. O. Sars's arrangement—the Calanoida and the Cyclopoida,—those described being chiefly fresh-water forms. In the present paper the species recorded belong for the most part to the Harpacticoida; the Monstrilloida and Caligoida are also represented, but only by one or two species.

### HARPACTICOIDA.

#### Fam. Harpacticidæ.

Genus HARPACTICUS, M.-Edwards, 1838.

*Harpacticus falklandi*, sp. n. (Pl. XIII. figs. 1-9.)

Female moderately robust, caudal rami very short. Antennules composed of nine joints, the first four tolerably

\* Cf. Ann. & Mag. Nat. Hist., January 1914, p. 1. I take this opportunity to thank Mr. Vallentin for his permission to examine this interesting collection, and also my son, Andrew Scott, A.L.S., for assistance with some of the more doubtful species, and for the drawings he has so kindly prepared for me.

stout and elongated, but the others are small, and the penultimate joint is only about half the size of the one on either side. The formula shows approximately the proportional lengths of the various joints:—

$$\begin{array}{ccccccccccc} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 \\ \hline 20 & 20 & 21 & 19 & 10 & 8 & 6 & 3 & 5 \end{array}$$

The outer ramus of the posterior antennæ is very small, slender, and two-jointed. Posterior maxillipeds stout; hand subglobular, with the palm hollowed out and fringed with small denticles; terminal claw curved and tolerably strong. First pair of legs moderately slender and elongated, inner ramus rather longer than the proximal joint of the outer, and both rami are armed with short and stout terminal claws (fig. 4). The next three pairs normal. The fifth pair are of moderate size, the proximal joint foliaceous, subtriangular in outline, and with the inner distal end somewhat produced, narrowly rounded, and provided with four setæ arranged as shown in the drawing; distal joint oblong, width equal to fully half the length, and with the angular extremity furnished with five setæ (fig. 7).

Length .7 mm (about  $\frac{1}{36}$  of an inch).

*Male*.—The male is rather smaller than the female and with the antennules modified for grasping. The outer ramus of the second pair of thoracic legs is stout and the joints are subequal, but the middle one is slightly larger than the first or third; the third joint has also the extremity abruptly and somewhat obliquely truncated; the inner ramus is about as long as the outer, but is not so stout, and the second joint is produced on its inner aspect into a long spiniform process extending beyond the end joint, which is small and narrow. The rami of the third pair are also nearly equal in length, but the outer is somewhat longer than the inner and tolerably stout, the proximal joint is rather longer than the others, and the end joint is obliquely truncated; the inner ramus is moderately slender. Fifth pair with the proximal joint obsolete or nearly so; the end joint is oblong and its width equal to rather more than half the length; the end is broadly rounded and furnished with five elongated setæ, four of them being tolerably stout and spiniform; the margins of the joint are also fringed with small spinules (fig. 8).

*Hab.* Collected in the vicinity of the Falklands by tow-net in November 1909.

This species has a resemblance to *Harpacticus flexus*,

G. S. Brady, but differs in the structure of the second maxillipeds and in some other anatomical details.

Fam. Tisbeidæ.

Genus TISBE, Liljeborg.

*Tisbe varians*, sp. n. (Pl. XIV. figs. 6-12.)

*Female*.—Antennules moderately elongated and composed of joints; the first two joints are tolerably stout, but the second is distinctly longer than the first or third; the others are small, especially the penultimate joint, which is only about half the size of the one on either side. The formula shows approximately the lengths of the various joints:—

$$\begin{array}{cccccccc} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 \\ \hline 14 & 21 & 16 & 10 & 6\frac{1}{2} & 5\frac{1}{2} & 3 & 6 \end{array}$$

Antennæ small, the outer ramus four-jointed. Second maxillipeds tolerably stout and armed with a strong terminal claw. First pair of thoracic legs also tolerably stout; the outer ramus is rather longer than the first joint of the inner one; the first and second joints are subequal, and the seta on the outer distal angle of the first joint is stout and spiniform, so also is the seta at the base of the joint; end joint short and furnished with slender setæ on its truncated extremity; first joint of the inner ramus moderately expanded and reaching nearly to the end of the outer ramus; it is provided with a tolerably long seta on the lower half of the inner margin; a stout spiniform seta also springs from the inner aspect of the basal joint and close to the proximal end of the inner ramus; the second joint of the inner ramus is narrower and rather longer than the first, and a long seta springs from near the proximal end of the inner margin; the end joint is very small and is provided with two short claw-like terminal spines (fig. 9). Other natatory legs slender and moderately elongated, as shown by the drawing (fig. 10), which represents the fourth pair. Fifth pair small and not very conspicuous; the end joint is moderately narrow and elongated, and bears five moderately slender setæ round the distal end. Caudal rami short, scarcely longer than the last abdominal segment.

A few specimens of this species were obtained on a mass of fish ova found by Mr. Vallentin on the shore at low-water springs.

This *Tisbe* resembles in some respects the *Tisbe armata*,  
26\*

G. S. Brady, from the German South Polar Expedition, 1901-1903, but differs in the structure of the antennules, the second maxillipeds, and, to a small extent, in the form of the fifth pair of legs. It appears also to be nearly allied to *Tisbe australina*, Scott, from Scotia Bay, South Orkneys, but the end joint of the fifth pair of legs is proportionally narrower. No males were observed.

Genus *ASPIDISCUS*, Norman, 1868.

*Aspidiscus australis*, sp. n. (Pl. XIV. figs. 1-5.)

*Female*.—The antennules are composed of nine articulations; the first three are tolerably stout and elongated, the fourth is also moderately stout, but is little more than half the length of the third; the remaining joints are narrow and short, except the end one, which is moderately elongated, as shown in the drawing (fig. 1). The formula shows approximately the proportional lengths of the various joints:—

$$\begin{array}{cccccccccc} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 & \\ \hline 12 & 15 & 13 & 7 & 4 & 2 & 4 & 5 & 11 & \end{array}$$

The antennæ and mouth-appendages are somewhat like those of *A. littoralis*, G. O. Sars; the second maxillipeds are small (fig. 2). In the first pair of thoracic legs the first joint of the inner ramus is tolerably large and expanded interiorly at the proximal end; the second and third joints are small, and the latter is provided with two short claws fimbriated on the lower margin; the outer ramus is shorter than the inner and composed of three joints, the end one being small (fig. 3). Other natatory legs somewhat similar to those in the species mentioned above. Fifth pair with the end joint tolerably large and lamelliform; its width is about equal to half the length, and its distal end is truncated and provided with three moderately stout and elongated setæ (fig. 4). The caudal rami are short.

Length .84 mm (about  $\frac{1}{30}$  of an inch).

No males were observed.

Three specimens of this *Aspidiscus* occurred in a small tow-net gathering collected in the vicinity of the Falkland Islands in Nov. 1909.

Fam. Thalestridæ.

Genus *PSEUDOTHALESTRIS*, Brady, 1883.

*Pseudothalestris nana*, sp. n. (Pl. XV. figs. 1-11.)

*Female*.—Cephalothorax stout, dorsum boldly arcuate,



abdomen short, reflexed. The antennules are also short and composed of seven joints; the first three are large, the next three small and subequal, while the end joint is nearly equal in length to that of the two preceding ones combined (fig. 2).

The outer ramus of the antennæ is only one-jointed, and in this respect it differs from some other species which are provided with a two-jointed outer ramus, but agrees with *Pseudothalestris tumida*, G. S. Brady, from Kerguelen Island\*. The other mouth-appendages are also somewhat similar to the species mentioned, especially the second maxillipeds, the hand of which is similarly provided with a small seta near the middle of the inner margin (fig. 9). The first pair of legs has, as usual, the outer ramus very short and composed of two distinct joints, the inner ramus is elongated and composed of three joints, but the last two are very small and subequal, and the terminal claw is elongated and slender (fig. 8). The other natatory legs are normal.

The fifth pair have the inner portion of the proximal joint moderately expanded and furnished with five setæ on the irregularly rounded apex; the distal joint is small, sub-quadriform, and bears five setæ arranged as in the drawing (fig. 10). The caudal rami are very short.

Male unknown.

The length of the specimen represented by the drawing (fig. 1) is .45 mm. (about  $\frac{1}{56}$  of an inch).

*Hab.* Obtained in a small gathering collected by tow-net in the vicinity of the Falkland Islands in Nov. 1909. Only one specimen (a female) was observed.

*Remarks.* The species described above resembles in some respects the *Pseudothalestris*, G. S. Brady, from Kerguelen Island, already referred to, in the structure of the outer ramus of the posterior antennæ and in the form and armature of the second maxillipeds; but the body is not so tumid, and there are one or two anatomical features in which it also apparently differs.

#### Fam. Diosaccidæ.

Genus AMPHIASCUS, G. O. Sars, 1905.

*Amphiascus proximus*, sp. n. (Pl. XVI. figs. 1-7.)

*Female*.—Species small: length .56 mm. (about  $\frac{1}{45}$  of an inch).

Antennules short, composed of eight joints; the first four

\* 'Deutsche Südpolar-Exped. 1901-1903,' Copepoda, p. 531, text-fig. 22.

are tolerably large, but the third is rather shorter than the other three, which are subequal; the four end joints are slender and the first three are moderately short, but the terminal one is somewhat elongated and nearly twice the length of the preceding joint. The formula shows approximately the proportional lengths of the various joints:—

$$\begin{array}{cccccccc} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 \\ \hline 10 & 10 & 9 & 11 & 8 & 6 & 7 & 12 \end{array}$$

The antennæ are small and are provided with a very small outer ramus. The second maxillipeds are also small; the hand is narrow and of moderate length, and bears a minute seta near the distal end of the inner margin. The inner ramus of the first pair of thoracic legs is elongated and slender; the proximal joint reaches beyond the end of the outer ramus, but the other two are short; the joints of the outer ramus are subequal and moderately stout, and furnished with long spiniform setæ (fig. 4). The other natatory legs are slender and moderately elongated (fig. 5). Fifth pair broadly foliaceous; the inner portion of the proximal joint is rather narrower than the outer distal one, and its obliquely truncated end is provided with four setæ of moderate length; the distal joint is tolerably expanded, its outer and inner margins are nearly parallel, and its extremity is irregularly triangular and furnished with five setæ arranged as shown in the drawing (fig. 6). The caudal rami are very short.

One or two specimens of this minute form occurred in the same tow-net gathering with the *Pseudothalestris* previously described. This species has some resemblance to *Amphiascus minutus*, G. S. Brady, from Kerguelen Island, but differs in the form of the fifth pair of legs and in one or two other anatomical details. The male was not observed.

### Fam. Laophontidæ.

GENUS LAOPHONTE, Philippi, 1840.

*Laophonte insignis*, sp. n. (Pl. XIII. figs. 10–15.)

*Female*.—Somewhat similar to the female of *Laophonte gracilipes*, G. S. Brady, from Kerguelen Island. Antennules moderately short and composed of seven articulations; the first three joints are large and together are equal to nearly two-thirds the entire length of the antennule; the remaining joints are small, but the two end joints are rather longer than

the two immediately preceding. The formula shows approximately the proportional lengths of the various joints:—

$$\begin{array}{cccccccc} 1 & 2 & 3 & 4 & 5 & 6 & 7 \\ \hline 10 & 14 & 15 & 5 & 5 & 6 & 6 \end{array}$$

Antennæ small, the outer ramus rudimentary and represented by two minute setæ (fig. 11). Second maxillipeds moderately stout and armed with a long terminal claw (fig. 12). The first pair of thoracic legs are tolerably stout and the inner ramus is furnished with a long and stout terminal claw; the outer ramus, which consists of three joints, is only about half as long as the first joint of the inner ramus (fig. 13). The fifth pair are broadly foliaceous; the inner portion of the proximal joint is somewhat expanded, and its distal end is obliquely truncated and furnished with four setæ, and there is also a seta on the inner margin; the two outermost setæ are close together, but the others are more widely apart; the outer joint is suborbicular and bears six setæ round its distal end, as shown in the drawing (fig. 14). The caudal rami are short and scarcely equal in length to the last segment of the abdomen.

The male was not observed.

This species has a general resemblance to *Laophonte gracilipes*, G. S. Brady, as already stated\*; but the antennæ have no outer ramus, and there is also a difference in the form of the fifth pair of thoracic legs.

## MONSTRILLOIDA.

### Fam. Monstrillidæ.

Genus MONSTRILLA, Dana, 1848.

*Monstrilla mixta*, sp. n. (Pl. XVI. figs. 8–12.)

*Female*.—In its general appearance and structure this form is somewhat similar to *Monstrilla conjunctiva*, Giesb., described in his account of the Copepoda of the Belgian Expedition, 1897–1898–1899†.

The body is moderately slender and elongated; the length of the specimen represented by the drawing (fig. 8) is about  $2\frac{1}{2}$  mm.; the proximal segment is fully half the entire length

\* Cf. 'Die marinen Copepoden der Deutsche Südpolar Exped. 1901–1903,' p. 562.

† 'Exped. Antarctic Belge: Copepoden,' p. 40, Taf. xii. figs. 1–6 (1902).

of the cephalothorax ; the abdomen is composed of three segments, the first being the largest. The antennules are very short, moderately stout, and composed of four joints, and are provided with tolerably long branching setæ. The natatory legs are similar to those in *M. conjunctiva*. The fourth pair (fig. 10), which have both rami three-jointed, are provided with densely plumose setæ ; the outer ramus is somewhat longer than the inner and has a short seta on the inner margin and a short spine on the outer distal angle ; there is also a short spine on the outer distal angle of the end joint ; the marginal seta on the second joint and those on the third joint are all elongated and plumose, except that the outer one on the last joint differs from the others in having its outer edge fringed with minute spinules. The middle joint has no spine exteriorly, but the rounded distal angle bears a few small bristles ; the first and second joints of the inner ramus have neither spines nor setæ on the exterior margin, but they each bear a long plumose seta on the inner margin, and five similar setæ spring from the inner margin and end of the third joint.

The fifth pair of legs are small, slightly expanded, and bilobed ; the inner lobe is without armature, but the outer is furnished with three setæ, one on the outer margin and two at the apex (fig. 11).

The bifurcated setiform appendage, which springs from the underside of the genital segment and upon which the eggs are clustered, is tolerably slender and elongated, being about equal to the entire length of the animal, the antennules included. The caudal rami are short and somewhat divergent ; they are each provided with four setæ ; the second seta from the inside is slender and only of moderate length, but the others are stout and considerably elongated ; one springs from the outer margin and the others from the apex.

*Colour.* As is usual, the body of the animal is of a reddish colour, but the cluster of eggs is bright green ; the size of the egg-cluster varies in different individuals.

*Hab.* Vicinity of the Falklands ; collected by tow-net ; one specimen at 6 fathoms and four at the surface.

*Remarks.* Though the Monstrillidæ are widely distributed, and a number of species have been described, yet comparatively few of them appear to have been obtained by expeditions to the Antarctic or Subantarctic Oceans. The somewhat erratic appearances of these organisms may probably be one reason for the apparent scarcity. Even in the British seas, though the Monstrillidæ are usually not very common,

their appearances have at times been frequently noticed, and a considerable time may elapse ere they are again met with.

The form recorded by Dr. Giesbrecht in his account of the Copepoda collected by the Belgian Antarctic Expedition, already referred to, was obtained in a plankton sample from 475 metres, taken in lat.  $69^{\circ} 54'$  S., long.  $82^{\circ} 49'$  W. ; only a single specimen was observed. This specimen was a male and is smaller than those from the Falkland Islands, which appear to be all females\* ; but although, as previously stated, there is a certain resemblance between the male described by Dr. Giesbrecht and those from the Falklands, I am unable, from the differences observed, to regard them as the male and female of the same species.

#### CALIGOIDA.

Genus CALIGUS, O. F. Müller, 1785.

*Caligus thynni*, Dana. (Pl. XVI. figs. 13, 14.)

A single specimen of a *Caligus*, which appears to be the male of *C. thynni*, Dana, was captured at Roy Cove, Falkland Islands, in 3 fathoms water, in December 1909. The specimen measures scarcely 3 mm. from the forehead to the end of the caudal rami, and is therefore considerably smaller than the females of that species are said to be. The males and females of these fish-parasites, however, frequently differ more or less from each other, not only in size, but also in their general appearance. Unless, therefore, both sexes are available for examination, there may be some difficulty in determining accurately the species they belong to. Figure 13 represents the general form of the specimen seen from the dorsal aspect, and figure 14 one of the fourth pair of legs. It would appear, from records previously published, that the male of *C. thynni*, like that of *C. rapax* in our own seas, is able to lead at times the life of a "free swimmer"; hence its occurrence in tow-net gatherings with other pelagic organisms.

\* In this group the males are almost invariably smaller than the females.

*A few of the Works and Papers consulted in the  
Preparation of the preceding Notes.*

(Addenda to List in first paper, pp. 10, 11.)

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EXPLANATION OF THE PLATES.

PLATE XIII.

*Harpacticus falklandi*, sp. n.

- Fig.* 1. Antennule, female.  
*Fig.* 2. Antenna.  
*Fig.* 3. Second maxilliped.  
*Fig.* 4. Foot of first pair.  
*Fig.* 5. Foot of second pair, male.  
*Fig.* 6. Foot of third pair, male.  
*Fig.* 7. Foot of fifth pair, female.  
*Fig.* 8. Foot of fifth pair, male.  
*Fig.* 9. Abdomen and caudal rami, male.

*Laophonte insignis*, sp. n.

- Fig.* 10. Antennule, female.  
*Fig.* 11. Antenna.  
*Fig.* 12. Second maxilliped.  
*Fig.* 13. Foot of first pair.  
*Fig.* 14. Foot of fifth pair, female.  
*Fig.* 15. Abdomen and caudal rami.

## PLATE XIV.

*Aspidiscus australis*, sp. n.

- Fig.* 1. Antennule, female.  
*Fig.* 2. Second maxilliped.  
*Fig.* 3. Foot of first pair.  
*Fig.* 4. Foot of fifth pair, female.  
*Fig.* 5. Part of abdomen and caudal rami.

*Tisbe varians*, sp. n.

- Fig.* 6. Antennule, female.  
*Fig.* 7. Antenna.  
*Fig.* 8. Second maxilliped.  
*Fig.* 9. Foot of first pair.  
*Fig.* 10. Foot of fourth pair.  
*Fig.* 11. Foot of fifth pair, female.  
*Fig.* 12. Part of abdomen and caudal rami.

## PLATE XV.

*Pseudothalestris nana*, sp. n.

- Fig.* 1. Female, side view.  
*Fig.* 2. Antennule, female.  
*Fig.* 3. Antenna.  
*Fig.* 4. Mandible.  
*Fig.* 5. Maxilla.  
*Fig.* 6. First maxilliped.  
*Fig.* 7. Second maxilliped.  
*Fig.* 8. Foot of first pair.  
*Fig.* 9. Foot of fourth pair.  
*Fig.* 10. Foot of fifth pair, female.  
*Fig.* 11. Abdomen and caudal rami.

## PLATE XVI.

*Amphiascus proximus*, sp. n.

- Fig.* 1. Antennule, female.  
*Fig.* 2. Antenna.  
*Fig.* 3. Second maxilliped.  
*Fig.* 4. Foot of first pair.  
*Fig.* 5. Foot of third pair.  
*Fig.* 6. Foot of fifth pair, female.  
*Fig.* 7. Part of abdomen and caudal rami.

*Monstrilla mixta*, sp. n.

- Fig.* 8. Female, side view.  
*Fig.* 9. Antennule.  
*Fig.* 10. Foot of fourth pair.  
*Fig.* 11. Foot of fifth pair.  
*Fig.* 12. Abdomen and caudal rami.

*Caligus thynni*?, Dana.

- Fig.* 13. Male, dorsal view.  
*Fig.* 14. Foot of fourth pair.

XLIII.—*The Species of Limnoria, a Genus of Wood-boring Isopoda.* By CHAS. CHILTON, M.A., D.Sc., LL.D., M.B., C.M., F.L.S., Professor of Biology, Canterbury College, N.Z.

[Plate XVII.]

ON July 29th, 1913, I received from the authorities of the Auckland Harbour Board a piece of timber that was being destroyed by a marine borer, with the request that I would see if the borer was the "gribble," *Limnoria lignorum*, Rathke. An examination at once showed that the borer was certainly a species of *Limnoria*; the decision as to whether it was the European species or not required some care, as in 1883\* I had described from Lyttelton Harbour, New Zealand, another species, *Limnoria segnis*, which in general appearance was extremely like *L. lignorum*, though differing from it in the characters of some of the mouth-parts and living on seaweed instead of boring into wood. A detailed examination and a comparison with specimens from Plymouth, England, showed, however, that the animal boring into the wood in Auckland Harbour was indeed *L. lignorum*. This conclusion, moreover, was confirmed by the fact that, accompanying the *Limnoria*, there were also some specimens of an Amphipodan borer, which, on comparison with specimens from Plymouth, England, proved to be identical with *Chelura terebrans*, Philippi, a species associated with *Limnoria lignorum* in Europe†. These two species must evidently have been introduced into New Zealand, probably in some old wooden vessel, and they thus afford an example of the accidental dispersal of marine Crustacea by means of ships, additional to those already recorded by me (1911, p. 131).

It cannot be ascertained for certain how long ago these two Crustacea were introduced into Auckland Harbour, but in all probability it was many years ago. They appear to find the locality favourable, for they were extremely numerous in the samples of wood that were sent down to me, and they seem to be causing rapid destruction, both of the softer timbers, such as Kauri, and even of harder kinds, such as Totara.

\* The references are made by the year of publication to the list at the end of the paper.

† It should be remembered that at Christmas Island, Indian Ocean, another species, *Limnoria andrewsi*, is associated with a different species of *Chelura*, i. e. *C. insulæ*, Calman (see Calman, 1910, p. 182).



To ascertain if the *Limnoria* occurred elsewhere in New Zealand, I applied to Mr. Cyrus Williams, Engineer to the Lyttelton Harbour Board, who most obligingly sent me a specimen of an ironbark pile, the outer part of which was partially destroyed. Examination showed that this destruction also had been caused by *Limnoria lignorum*, though in this particular case it appeared to be unaccompanied by *Chelura terebrans*. Mr. Williams stated that in Lyttelton Harbour the animal could perhaps hardly be called a borer, as it seemed to operate only on the surface, removing about one inch from the outside of an ironbark pile in about thirty years, though with softer timber its operations were much more rapid. Later on, in December 1913, I found the same species, *Limnoria lignorum*, boring into piles in Akaroa Harbour, though here again it did not appear to be accompanied by the *Chelura*.

Probably it will be found that *Limnoria lignorum* has been similarly introduced into many other harbours. In a paper on the marine wood-borers of Australia, read at the Melbourne Meeting of the Australasian Association for the Advancement of Science, in January 1900, Mr. Chas. Hedley (1901, p. 237) stated that neither *Limnoria lignorum* nor *Chelura terebrans* had up to that time been recorded by naturalists from Australasian seas, but in a footnote, added on the 14th June, 1901, as his paper was passing through the press, he states that Mr. T. Whitelegge had identified *L. lignorum* from timber from a floating jetty at Circular Quay, and again from part of the hull of a ferry-boat plying in Sydney Harbour.

In the timber, both from Auckland and from Lyttelton, I found, along with the *Limnoria*, numerous specimens of another Amphipod, "*Corophium contractum*," G. M. Thomson (1881, p. 220). The *Corophium*, however, did not appear to be boring into the timber, but to be merely taking advantage of the decay caused by the *Limnoria*, and thereby securing a suitable dwelling-place and probably also food. Dr. Macdonald has (1875, p. 67) described a similar association in England, where *Tanais vittatus* was found in the holes bored by *Limnoria lignorum* and *Chelura terebrans*.

In this paper I do not propose to deal with the borer from the economic aspect; some details of the damage done in Australasia by these Crustacea and by other borers is given in Mr. Hedley's paper. The examination of the specimens, however, necessitated a comparison with *L. segnis*, a species which does not bore into wood, but lives on seaweed, parti-

cularly on the branching holdfasts of *Macrocystis*. This rendered necessary also an examination of the characters of the other species of *Limnoria* that have been described during recent years, and has led to one or two results which are perhaps worthy of being placed on record. I have had for examination numerous specimens of *L. lignorum* and of *L. segnis*, and I have also been able to examine two specimens from the South Orkney Islands which appear to belong to *L. antarctica*, Pfeffer. These were found among the "residues" of some Amphipodan collections made by the 'Scotia' Expedition in 1903, and were presumably taken free, *i. e.* not boring into wood.

In 1904, the Rev. T. R. R. Stebbing (1904, p. 714) enumerated four species known at that time, with the characters that appeared to distinguish them. Since then two other species have been described, making six species in all. These species are :—

1. *Limnoria lignorum* (Rathke), 1799. Length 5 mm. Wood-borer, abundant in Europe and on the eastern coast of North America, also recorded from the Pacific and from San Diego, California.
2. *L. segnis*, Chilton, 1883. Length 5 mm. Species living on seaweed and not boring into wood, Lyttelton and Akaroa Harbours, New Zealand.
3. *L. antarctica*, Pfeffer, 1887. Length 4.5 mm. Found in holes bored in seaweed, South Georgia; also taken at the South Orkneys.
4. *L. pfefferi*, Stebbing, 1904. Length 3.5 mm. Found in rotten wood in lagoon, Minikoi, Indian Ocean.
5. *L. japonica*, Richardson, 1909. Length 5 mm. Taken from crevices in water-logged fragment of bamboo, Japan.
6. *L. andrewsi*, Calman, 1910. Length about 2 mm. Boring in piles, Christmas Island, Indian Ocean.

These six species form a very natural group, and are all very much alike in size, general appearance, and in the general form and structure of the different appendages. They seem to differ mainly in the proportions of some of the mouth-parts and of the other appendages. The chief points that have been used to differentiate them are the shape and size of the epipod of the maxillipeds, the character of the palp of the mandible, the relative size of the rami of the uropods and their proportion to the peduncle, and the presence or absence of a comb-like spine on the propod of the first gnathopod; other distinctions have in certain cases

been drawn from the shape of the body, the proportions of its different segments, and the presence or absence of tubercles on the dorsal surface of the pleon.

*Limnoria lignorum* has been fully described by Harger, Sars (1897, p. 76), and others, and its characters are pretty well known. *L. antarctica* was described in great detail by Pfeffer in 1887, and in the descriptions of *L. pfefferi* and *L. andrewsi* special notice has been taken of the characters distinguishing the species. Of *L. segnis* only the short original description has been published, and it will be convenient to consider its characters here somewhat more fully and with special reference to the points mentioned above.

*Limnoria segnis*, Chilton.

*Limnoria segnis*, Chilton, 1883, p. 76, pl. ii. fig. 1; Stebbing, 1904, p. 714.

*General Description and Comparison with other Species.*—

The general appearance is in close agreement with *L. lignorum*, though the body is usually slightly broader and more convex and looks rather more compact. The whole surface is thickly covered with short setæ, with some longer ones, especially on the margins of the segments. The body is generally of a dull white or cream colour, and does not show the grey markings usually present on *L. lignorum*. As in that species and in *L. pfefferi* the head is almost globular and is narrower than the rest of the body; the first segment of the peræon is longer than any of the succeeding, but I have not noticed on it the conspicuous dorsal V-shaped grooving described by Stebbing for *L. pfefferi*; the side-plates agree generally with those of *L. lignorum*, and the same is true of the pleon and the terminal segment.

The fifth segment of the pleon is much longer than any of the four preceding, especially in the median line, and in dorsal view it shows the shape as drawn by Pfeffer for *L. antarctica*; it bears a faint median ridge. On the last segment, near its anterior margin, there is a slight median elevation or tubercle, from which extend posteriorly two faint parallel ridges. These markings are visible only in specimens that have been dried, and even then, owing to the short setæ covering the general surface of the body and the extraneous matter entangled in them, they are not always very distinct, especially in smaller specimens; they are, however, interesting as showing some approach to the tubercles and ridges described by Miss Richardson in

*L. japonica*. In side view the small tubercle on the last segment presents pretty well the appearance shown by Pfeffer in his side view of *L. antarctica*.

The upper antennæ have the second joint subequal with the first and slightly longer than the third, the flagellum is represented by two or three small joints bearing long olfactory setæ. I have not seen anything corresponding to the small nodule described by Calman (1910, p. 184) as perhaps representing a vestige of the inner flagellum. The second antennæ do not differ appreciably from those of *L. lignorum*.

In the mouth-parts, the mandibles (Pl. XVII. fig. 1) differ distinctly from those of the other species in having the palp quite small and composed of two subequal slender joints, the terminal one of which bears two or three small setæ at the extremity. The body of the mandible appears to be very similar to that of *L. lignorum*, and ends in a fine sharp cutting-edge, which shows no division into separate teeth; on the outer portion between the cutting-edge and the palp is a strong subacute projection as in *L. lignorum*, and on the inner side there is the usual row of setæ, though apparently no trace of the molar tubercle.

The cutting-edge of the mandible in *L. lignorum* is usually shown as entire and not divided into teeth; in one specimen, however, that I examined there are faint indications of its division into three teeth (fig. 6). In this specimen, too, the inner surface below the cutting-edge was covered with small, closely-set, imbricating teeth forming an efficient rasping organ; probably the same structure is common to other specimens, but it is rather difficult of observation, and I failed to detect it in some specimens examined, though it is quite distinct in the one figured.

The first and second maxillæ are essentially the same as those of *L. lignorum*, except that the first maxilla appears to be slightly shorter and stouter.

In the maxillipeds (fig. 2) the epipod reaches beyond the end of the second joint and is rounded at the end, slightly narrowed towards the base, and its greatest breadth is about one-fourth the length; the whole margin of it is fringed with small finely plumose setæ. In other respects the maxilliped is hardly distinguishable from that of *L. lignorum*.

The first pair of legs (figs. 3 and 4) resembles that of *L. lignorum*, and the accessory spine on the inner side of the dactyl is bidentate as in that species, its smaller tooth being of minute size; in *L. andrewsi*, Calman, the accessory spine is tridentate; from the distal end of the propod there springs

a large spine with a single row of comb-like teeth, similar to the one described by Calman in *L. andrewsi*. I find, however, that this comb-like spine is present also in *L. lignorum* and in *L. antarctica*. The meral and carpal joints and the base of the propod bear small blunt tubercles, similar to those in *L. lignorum*, though less prominent.

The remaining legs appear to be similar to those of *L. lignorum*, and as in that species the accessory spine on the inner side of the dactyl is simple. The meral and carpal joints of the anterior legs are provided with blunt spines or tubercles as in the first pair. Calman states that in *L. andrewsi* none of the distal segments are provided with tubercles or blunt spines; the development of these tubercles in the specimens of *L. segnis* and of *L. lignorum* that I have examined seems to be subject to some variation, as they are sometimes more prominent than others, and they appear to be best marked in the larger specimens; Calman's specimens of *L. andrewsi* were only about 2 mm. in length, and their small size may account for the absence of these tubercles. The tubercles are present in *L. antarctica* and apparently also in *L. pfefferi*; indeed, all the peræopoda of the last species, as described by Stebbing, seem closely similar to those of *L. lignorum* and *L. segnis*. In all the species all the legs are provided with prominent pectinate spines, similar and similarly arranged to those in *L. lignorum*; these doubtless serve some useful purpose in connection with the life of the animal, though it is not easy to see what their precise function is.

The pleopoda do not appear to differ from those of *L. lignorum*; the last pair has the margins of both plates free from setæ. The uropoda (fig. 5) have the inner ramus slightly shorter than the stout peduncle and ending in a tuft of long setæ; the outer ramus is small, curves downwards, and has the extremity unguiform; the peduncle is produced between the rami into a subacute projection. The peduncle bears on the lower side, near its outer margin, a longitudinal row of long plumose setæ, as in *L. lignorum* and *L. pfefferi*, but has the outer margin almost smooth instead of being tuberculated as in *L. lignorum*; in some specimens of that species that I have examined, however, these tuberculations are by no means distinct. In his table giving the distinctions between the species, Stebbing describes *L. lignorum* as having the outer ramus of the uropods "unguiform," and thus distinguished from the other species in his list (*L. segnis*, *L. antarctica*, and *L. pfefferi*), in which it is not unguiform. Whether the outer ramus in *L. segnis* should be called "unguiform" or not is largely a matter of definition, but it

seems to me to be quite as unguiform as in most of the specimens of *L. lignorum* that I have examined.

A comparison of the uropoda of the species at my disposal shows that the structure is essentially the same throughout and that the resemblances are very close, closer than might be anticipated from a comparison of the figures given by different authors. In all three the peduncle bears on the under surface, at some little distance from the outer margin, a longitudinal row of long, finely plumose hairs; other hairs of more unequal length fringe the actual margin. The end of the peduncle is produced on the underside into a small subacute triangular process between the bases of the rami. The inner ramus is much the longer and bears at the extremity, which is usually truncate, a tuft of long setæ, about as long as the ramus itself; other setæ may be present on the outer margin, but the inner margin seems in all cases almost free from setæ. The inner ramus is short; it curves outwards and ends in a nail, at the base of which, on the concave side, is a tuft of about three setæ which reach beyond the end of the nail.

In *L. lignorum* the outer margin of the peduncle usually bears a number of small tubercles or small blunt spines. I have, however, failed to find these in some of the Auckland specimens, in which the outer margin is slightly roughened only; in these specimens the uropod is hardly distinguishable from that of *L. segnis* (compare figs. 5 and 7).

In the specimens from South Georgia, which, I have no doubt, must be referred to *L. antarctica*, Pfeffer, the outer margin of the peduncle (fig. 8) shows slight evidence of tuberculation; both rami are short, though not quite so short as is shown in Pfeffer's figure, taken from South Georgia specimens, and in one specimen, a small one, it has a nail at the end quite similar to that in *L. lignorum*, though smaller. In *L. pfefferi* the figure given by Stebbing shows that the peduncle is the same as that in *L. lignorum* or *L. segnis*, and it is probable that the whole uropod of *L. pfefferi* is practically the same as in these two species. The uropoda of *L. andrewsi*, as drawn by Calman, have a short peduncle and look rather different from those of the other species, but his figure is too small to show the details referred to above.

From the foregoing account it will be seen that there is a very great resemblance between all the species, both in general appearance and also in more minute characters of the various appendages; they constitute a well-marked genus, which occupies an isolated position under the Sphæromidæ.



geographical distribution, and, in the case of *Limnoria*, it seems possible to find some connection between the species and their distribution. Thus *L. segnis*, which has probably been long separated, geographically, from the other species, is distinctly marked off from them by its very small two-jointed mandible. *L. lignorum*, which is found in the north, also far removed from most of the other species, shows distinct differentiation from them in the small size of the epipod of the maxillipeds; of *L. japonica* we have unfortunately no information as to the mouth-parts, but from the description it appears that it is closely related to *L. lignorum*, differing only in the possession of tubercles on the pleon, and it may be anticipated that its mandible will be found to be three-jointed and the epipods of the maxillipeds to be short; it comes from Japan, not so very far from the Pacific Coast of America, from which *L. lignorum* has been recorded. The remaining three species seem more closely connected with one another, both in structure and in distribution; there is little essential difference in their mouth-parts, and it is difficult to say whether they can continue to be considered as distinct species when forms from intermediate localities have been found. *L. antarctica* appears to be fairly well marked off from the other two by the small size of both rami of the uropoda, and *L. andrewsi* may be distinguished from *L. pfefferi* by the shortness of the peduncle of the uropoda; though these characters are proportional only and may perhaps be found to vary with the age of the specimen.

All the species, except *L. segnis* and *L. antarctica*, appear to be wood-borers, and it seems likely therefore that the wood-boring habit is characteristic of the whole genus and that some of the characters of the animal, such as the small size of the body and the shortness of the antennæ and the peræopoda, are associated with the wood-boring habit. The wide distribution of the various forms and their small amount of difference may therefore be accounted for by their dispersal by means of floating logs into which they were boring; if this is so, then the two species which are not now wood-borers must have lost the wood-boring habit through being cast on some shore where wood for boring was not available, and having had to adapt themselves to another mode of life. It is possible that this occurred on the Antarctic Continent, and that *L. segnis* has reached New Zealand by way of the Antarctic Continent, and in doing so has had the mandibular palp more reduced than it is in *L. antarctica* (the species to which it is probably most nearly allied) and in the species living in the Indian Ocean.



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### EXPLANATION OF PLATE XVII.

- Fig. 1. *Limnoria segnis*: mandible.  $\times 100$ .
- Fig. 2. " " maxilliped.  $\times 100$ .
- Fig. 3. " " first leg.  $\times 80$ .
- Fig. 4. " " extremity of first leg, more highly magnified.
- Fig. 5. " " uropod.  $\times 100$ .
- Fig. 6. *Limnoria lignorum*: extremity of mandible, inner side.  $\times$  about 275.
- Fig. 7. " " (specimen from Auckland Harbour); uropod.  $\times 100$ .
- Fig. 8. *Limnoria antarctica*: uropod.  $\times 100$ .

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XLIV.—Some Remarks on Dr. D. G. Elliot's 'Review of the Primates.' By HERBERT C. ROBINSON, C.M.Z.S., and C. BODEN KLOSS, F.Z.S.

THE American Museum of Natural History has recently published, in three bulky and handsomely got-up quarto volumes, 'A Review of the Primates'\*, by the veteran

\* Monographs of the American Museum of Natural History, Monograph Series, Volumes I.-III. 'A Review of the Primates,' by Daniel Giraud Elliot. New York, U.S.A., June 1913.

ornithologist and mammalogist, Daniel Girard Elliot. Its appearance has been awaited with some interest by workers in mammals, as no recent monograph of the Lemurs or Monkeys exists, that of Schlegel \*, published in 1876, being much out of date, while Forbes's 'Handbook of the Primates' †, is much compressed and admittedly elementary in treatment.

It must be confessed, however, that the present work is extremely disappointing, and that the author altogether fails to conform to the high standard of precision and exact description set by other workers in the United States in many departments of Zoology, but more especially in the domain of Vertebrata.

In the first place, he has apparently not yet grasped the essential nature of a subspecies or local race, and, consequently, admits to full specific rank forms that even subspecifically are of very doubtful value, because, in his own words (Vol. I. p. iv), "Intermediates between what are regarded as species have rarely been found in this order, and neither of the two forms, no matter how closely they are evidently related, can properly be deemed a subspecies, no intermediates having been observed. Also the author has not seen his way to establish a subspecies between the dweller on an island and one of the mainland, because, no communication being possible, the appearance of intermediates would seem most improbable; not so, however, with the dweller on contiguous islands which may at one time have been portions of a larger island, or where communication between the islands may be, or at an earlier period has been, possible. Under such conditions subspecific forms may be found; but on the mainland, where there is no evidence of a gradation from one form to another, subspecies may not be accepted."

Dr. Elliot has overlooked several facts which render the arguments on which the above statements are based altogether fallacious. It is safe to assert that, with exceedingly few exceptions, monkeys are never represented, even in the largest Museums, by such complete series, either from the same localities or from the general range of the species, as are species of such orders as Chiroptera, Insectivora, or Rodentia. Most institutions are satisfied when a monkey is represented by five or six specimens covering the whole of

\* Muséum d'Histoire Naturelle des Pays-Bas, par H. Schlegel, Tome vii. Monographie 40: Simiæ. Leide: E. J. Brill, 1876.

† Allen's Naturalists' Library. 'A Handbook of the Primates,' by Henry O. Forbes, LL.D., F.Z.S. 2 vols. London: W. H. Allen & Co., Ltd., 1892.

the range, and, this being the case, variation (which may be, and often is, due to the locality) is liable to be ascribed to sex or age or to individual variability, which in this group, more especially as regards cranial characters, is wider than in most other orders.

The argument as regards the use of binomial nomenclature for insular races is much used by American naturalists, but appears to us, if only on account of convenience, to be quite untenable.

In addition, it ignores the factor of time, which is quite as important as locality in developing new races. A mammal, isolated on an island, may rapidly alter from the form found on adjacent islands or mainland; but it will be conceded that at a time, possibly very recent, speaking geologically, when the island was stocked, the relatively different disposition of land and sea may have permitted the free commingling of the parent forms, and that at the best the modern insular races are merely the terminal twigs of a much-branched tree.

The larger mammals are, of course, apparently less variable, because, as compared with the smaller quickly breeding forms, their races, in terms of generations, are much younger.

It is, moreover, a very significant fact, that in related groups of the same genus, only those separated by deep sea from other forms develop, as a rule, other than the most trivial differential characters.

Had the author been at the trouble to show by means of trinomials the relationships of the various forms to each other, we should have had a more valuable and instructive work than is actually the case; while, if pains had been taken to apply the synonymy of the older writers to the actual forms to which it refers, many apparent misstatements and contradictions would have been avoided. As it is Dr. Elliot's jumble of species is, if anything, worse than his jumble of localities.

We do not propose to deal with other than species occurring in the Malayan region, but there is no reason to suppose that the sections dealing with the African and Neotropical genera are of a higher standard than that on which we are in a position to offer comments.

#### Genus NYCTICEBUS. (Vol. I. p. 21.)

The name *Nycticebus tenasserimensis* (p. 25) has been applied to a reproduction by Blanford\* of a drawing by

\* 'Fauna of British India: Mammalia,' 1888-91, pp. 45, 46, fig. 12.

Tickell, but as no type is in existence it cannot be recognized, especially as the very brief description, "Dorsal stripe bifurcating on the forehead and encircling the eyes. Colour pale rufescent," discloses no differential characters.

On page 30 (Vol. I.) the geographical range of *N. malai-anus* is said to be "Chittagong, through Arakan as far south as Tringganu, Lower Siam."

It is obvious that two local races cannot occupy the same area, and it may also be remarked that Trengganu, a protected state in the central section of the Malay Peninsula, is not "Lower Siam," and that the range of *N. malai-anus* extends over the whole of the Malay Peninsula as well as the islands of Singapore and Penang, and is not restricted to the northern half, as Dr. Elliot would appear to infer. Specimens from Johore, collected by Dr. W. L. Abbott, are recorded by Lyon (Proc. U.S. Nat. Mus. xxxi. p. 537, 1906).

*Pithecus rufescens.* (Vol. II. p. 193.)

It is only the females and immature of this species that are bright red; the adult male is seal-brown with very long hair on the shoulders.

The range is from Muleyit in Tenasserim to Trang and Patelung in the northern parts of the Malay Peninsula, the former locality having been duly recorded by Bonhote (P. Z. S. 1900, p. 871).

*Pithecus adustus.* (Vol. II. p. 206.)

This form can only doubtfully be maintained, as animals, even from the south of the Malay Peninsula, are frequently annulated. Dr. Elliot gives it as representing the Sumatran animal in Tenasserim, but on the preceding pages gives the range of that form, *P. nemestrinus*, as Southern Burma, Malay Peninsula, &c. If sufficient variation from the typical Sumatran form should be proved, all mainland specimens will probably have to bear the name *adustus*, but existing material, which is considerable, tends to show the contrary.

In 1908 the Federated Malay States Museums undertook a collecting expedition of some months' duration to the Rhio-Lingga Archipelago and the adjacent parts of Johore and Singapore Island.

The collection of mammals obtained was very large, and a fully representative set was presented to the British

Museum, which was duly reported on by Messrs. Thomas and Wroughton\*.

Amongst the monkeys sent were twenty specimens of the present genus, consisting of ten males and ten females, from the following islands :—

Singapore.  
Tinggi, East Coast of Johore.  
Bintang.  
Batam.  
Karimon.  
Kundur.

Old males of this species are more difficult to obtain than younger animals and females, but the series was especially selected by us to include as many adult animals as possible. From this very limited material Dr. Elliot has, however, created five "species," viz. :—

*Pithecus dollmani* : Singapore.  
*Pithecus latus* : Tinggi and Tioman.  
*Pithecus bintangensis* : Bintang and Batam.  
*Pithecus karimoni* : Karimon. Material examined,  
four males and two females.  
*Pithecus alacer* : Kundur : a male and a female.

*Pithecus dollmani*. (Vol. II. p. 248.)

The type is not from "Tjangi, Island of Singapore, south-eastern part," but from Changi, N.E. corner of Singapore Island.

The type, though an adult animal, has extremely broad incisors ; but in this genus the character is of no importance, as the breadth appears to diminish with age.

The size of the last molar is given as 89·7 by 60 (presumably millimetres, as all other measurements are given in these), which is, of course, impossible.

*Pithecus latus*. (Vol. II. p. 236.)

The type locality should be spelt Tinggi not "Tingi."

This has, on account of its pale colour, rather better claims to subspecific rank than any other of Dr. Elliot's "species," but it will generally be found that forms affecting the sea-coast, where they are exposed to the bleaching effect of salt air and water, are paler than those from more inland districts.

\* Thomas and Wroughton, Journ. Fed. Mal. States Mus. vol. i. pp. 99-129 (1909).

Tioman specimens are darker than those from Tinggi, and the type from the latter island was an abnormally large solitary male with the sagittal crest unusually well developed.

*Pithecus bintangensis.* (Vol. II. p. 246.)

Specimens from Batam and Bintang can be exactly matched by others from the mainland of the Peninsula.

The two islands are separated by a Strait not broader than five or six miles with intervening islands.

*Pithecus karimoni.* (Vol. II. p. 227.)

The measurements given by Dr. Elliot (viz., total length 906; tail 432; foot 152; ear 35) are not those of the collector, as they are stated to be, but should read—total length 956; tail 482; hind foot 125; ear 35.

The alteration of these dimensions is quite unwarrantable, the more so as the result is to force the species into the author's subgenus *Neocebus*, and thereby separate it subgenerically from the mainland macaque, which, to anyone who has examined the skins and skulls or is acquainted with the animals in life, is absurd.

*Pithecus alacer.* (Vol. II. p. 226.)

In this species also measurements are not those of the collector, and the total length should read 844 and not 794 as given by Dr. Elliot. When he comes to deal with the common Crab-eating Macaque of Burma, Tenasserim, and the Malay Peninsula, Dr. Elliot has created even greater confusion.

For the mainland form of Burma and Tenasserim he has, following Cabrera, revived Cuvier's name *Macacus irus* (Vol. II. p. 229), the type of which (though it is not actually so stated) probably came from Malacca.

The range of this form he gives as Burma, Arakan, Tenasserim, and Malay Peninsula.

Since Bonhote's paper, writers on Malayan mammals have used the name *fascicularis* for this race, the type of which came from Sumatra; but Dr. Elliot restricts it to Sumatra and, *mirabile dictu*, the islands Terutau and Langkawi (Vol. II. p. 233), which are well within the ten-fathom line in the immediate neighbourhood of the Peninsula coast, while there is over 25 fathoms with wide stretches of sea between them and Sumatra.

Misled by the unfortunate geographical term "Lower Siam," he has described another "species," *P. capitalis* (Vol. II. p. 235), as inhabiting Trong and Telibun Island.

Trong, or rather Trang, is a district on the mainland of the Peninsula, about 50 miles north of Langkawi, and Telibun an island off its coast, separated by an exceedingly shallow channell.

According to our author, therefore, despite the fact that (pp. iv, v, Preface) "intermediates between what are recorded as species have rarely been found in this order," and that "on the mainland where there is no evidence of a gradation from one form to another subspecies may not be accepted," we have the extremely curious case of discontinuous distribution of *Macacus irus*\* separated in a continuous land-area by an intrusive form, *P. capitalis*, which presumably does not intergrade, as it is named binomially.

There is the further case of discontinuous distribution of *M. fascicularis* met with on Sumatra and the islands of Terutau and Langkawi.

In reality, the whole treatment of the group forms a most admirable example of the danger of working with insufficient material and with imperfect knowledge of the geography of the area dealt with.

#### Genus PYGATHRIX (*Presbytis* or *Semnopithecus*).

Dr. Elliot has thrown the section containing the species lately known as *femoralis* (*nomen nudum*) into hopeless confusion.

The specimen on which the name *femoralis* was founded was originally obtained somewhere in Sumatra by Raffles, though in his paper in Trans. Linn. Soc. vol. xiii. (1822), are given, evidently in error, the localities Pulau Penang and Singapore. Later, Müller and Schlegel described, and figured as *Semnopithecus sumatrana*, a form from Mount Ophir in the Padang Highlands, W. Sumatra (subsequently, however, referred by the latter to *S. femoralis*) †, which is clearly distinguishable from the form inhabiting the Peninsula and adjacent islands, which is *P. neglecta* (Schlegel) ‡.

The Bornean representative is described by Müller and Schlegel as *P. chrysomelas*.

In dealing with what he calls *P. femoralis* (Horsf.)

\* We ourselves do not possess any examples of the Common Macaque from Burma and Tenasserim, and are therefore not in a position to deny the statement that the *M. irus* occurs there.

† Mus Pays-Bas, p. 457.

‡ *Op. cit.* p. 47.

(Vol. III. p. 45), Dr. Elliot has made the following errors :—

(1) He has indicated as the type locality Bankasun in Tenasserim, whence a specimen was forwarded in 1877 by Davidson, forty-seven years after the species was first named.

(2) On the strength of Hose's field-notes\*, describing the Bornean form as *P. femoralis* and not as *P. chrysomelas* (of which name Hose was apparently ignorant), he has added the locality Borneo to the range, and, while following Schlegel's identification of *P. femoralis* with the latter's own *P. sumatrana* (Vol. III. p. 43), he has stated that these representative forms occur on the same mountain, which is, to say the least, highly improbable (pp. 28 and 29).

But, since in a "Key to the Species" (p. 30) it is stated that *P. femoralis* has the "tail white at base beneath," while on page 46 we are told that "The tail, however, is never whitish at the base beneath," one may say, without unfairness, that Dr. Elliot cannot recognize his material nor the species to which he ascribes it.

In 1911 we described as *P. n. keatii* a race of *P. neglecta* from Trang, North Malay Peninsula, founding it on three specimens from the type locality and three from Perak, while several others from northern parts of the Peninsula have since been obtained. Dr. Elliot has seen fit, without examination of the specimens, to state that our type is a young adult, though it was specifically stated to be an adult male. After examination of a considerable series from all parts of the Peninsula, from Singapore to Bandon, we are in a position to state definitely that the northern form differs in the characters stated from the southern, although, of course, as is necessarily the case in a species inhabiting a continuous land-area, some gradation takes place. We are not aware that Dr. Elliot has examined more than the series of specimens extant in the British Museum, which have also passed through the hands of one of us and are either old and deteriorated or badly prepared skins.

*Pygathrix flavicauda* (Vol. III. p. 50), of which, thanks to the kindness of the authorities of the United States National Museum, we have examined one of the typical specimens from Trang, is apparently based on a somewhat young specimen of *Pygathrix obscura halonifer* (Cantor), which was originally described from Penang. We have other adult specimens from Trang, and they can in no way be

\* 'A Descriptive Account of the Mammals of Borneo,' by Charles Hose, F.Z.S. London, 1893, p. 13.



separated from those described as *Pres. obscura carbo* by Messrs. Thomas and Wroughton (Ann. & Mag. Nat. Hist. (8) iv. p. 534, 1909) from Langkawi and Terutau.

The measurements given by Dr. Elliot of the type of *P. carbo* (Vol. III. p. 54) are:—"Total length 1380; tail 800; hind foot 125." Those taken by the collector in the flesh were:—"Total length 1240; tail 740; hind foot 152. The emendation is not in the direction of accuracy, as no full-grown monkey in this group has so small a foot as indicated by Dr. Elliot.

*Pygathrix nubigena*, Elliot (Vol. III. p. 55), is a pure synonym of *Pygathrix siamensis*, Müller & Schlegel (Vol. III. p. 59). Schlegel, in his monograph on the monkeys (Mus. Pays-Bas, 1876, p. 38), expressly states that the types were collected by Diard in Malacca, and the locality Siam was ascribed to them in error, as it also was to certain specimens of *Pygathrix obscura* obtained by the same collector (p. 49). The locality "Keka," given by Dr. Elliot for his type of *P. nubigena*, is merely the native name of the species, as noted by Dr. Cantor on the label. The specimen in the British Museum ascribed to *Pygathrix siamensis* by Elliot (Vol. III. p. 60) from Takamen, Siam, collected by Flower, is really *P. germani* (Milne-Edwards) (Vol. III. p. 82), and field-notes on specimens from the same locality by the same collector are inserted under this species.

*Pygathrix rhionis* (Vol. III. p. 58) has nothing to do with *P. obscura* as stated, but is closely allied to *P. siamensis* and *P. dilecta*, and its affinities are correctly given by Miller in the original description.

*Pygathrix cristata* (Vol. III. p. 79) is a common monkey in suitable localities along the western coast of the Malay Peninsula, and is not confined to Sumatra as stated.

Dr. Elliot cites Muleyit in Tenasserim as a locality for *Pygathrix obscura* (Vol. III. p. 53), and then describes the specimens which are the authority for this locality as a new species, *Pygathrix crepuscula* (Vol. III. p. 84), which may be valid if regarded as a subspecies of *P. obscura*.

The type of *Pygathrix crepuscula wroughtoni* (Vol. III. p. 85), which one of us has examined, is practically identical with specimens of *P. obscura* from the Patani coast, N.E. Malay Peninsula. Judging from the dimensions, it is almost certainly a female, and should not have been described, except on a reasonably large series.

Passing to the Hylobatidæ, or Gibbons, we may note that the Malay Peninsula is omitted from the distribution of *H. agilis* (Vol. III. p. 160), though its occurrence has been

frequently noted in the literature, while there are specimens from Perlis in the British Museum. Dr. Elliot, however, has, without comment, transferred Flower's notes on the habits of *H. agilis* to *H. lar*, though that author was perfectly correct in assigning the Larut Hills gibbon to *H. agilis*.

Under *Symphalangus syndactylus* the remark on p. 178 (Vol. III.) that if the *S. s. continentis*, Thomas, eventually proves to be a distinct race of the Sumatran species, then it is not at all probable that this species is to be found anywhere on the "Malay Peninsula," savours of the obvious, and argues a very pre-Darwinian definition of the value of a "species" on the part of Dr. Elliot.

Under *Symphalangus syndactylus continentis* the reference to the type description is misquoted, and should read as p. 301, not p. 30.

The type locality is Semangko Pass, Selangor-Pahang Boundary, not Gemangko Pass, Selangore, Padang Boundary—"Padang" being in Sumatra.

The measurements given are hopelessly mixed. The total length of the skin should be 546, not 846 mm.; while the greatest length of the skull is 127·5, not 43·9. The inter-temporal breadth 43·5, not 107·5; and the zygomatic width 89, not 86·6.

The acquisition of additional material shows that the race, though, of course, not a strongly marked one, is sufficiently differentiated from the Sumatran animal.

In conclusion, we may remark that the paper and typography of the work are excellent; while the illustrations, especially those of the skulls, are all that can be desired.

It is unfortunate, however, that there are an extraordinarily large number of references miscited, and, so far as we have checked them, the measurements are hopelessly incorrect, while the spelling of geographical names is careless and not in accordance with custom or any consistent scheme. Taking one page at random (p. 22, Vol. III.), we find the following errors:—

line 6, *Keka* is the native name of the species, not a place.

line 7, *Selangore is now invariably spelt Selangor.*

line 11, *Turutau should read Terutau.*

line 12, *Batsu should read Batu, and Bitang should read Bintang.*

line 14, *Langhat should read Langkat.*

line 15, *Padung should be Padang and Indrapore, Indrapura.*

line 17, *Katiman should read Kateman.*

line 21, *Pagee should be Pagi, and Metawee for the well-known Mentawai has the merit of novelty and nothing else.*

But to multiply further instances is to labour the point unnecessarily.

Our criticisms may seem unduly fault-finding, but it is in our opinion most unfortunate that such a group as the Primates should have met with treatment so inadequate and slipshod as compared with the admirable works produced on the Chiroptera and on the Mammals of Western Europe by Messrs. Knud Andersen and Miller.

XLV.—*Notes on the Apidæ (Hymenoptera) in the Collection of the British Museum, with Descriptions of new Species.*  
By GEOFFREY MEADE-WALDO, M.A.

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IV. Subfamily *ANTHOPHORINÆ*.

In this subfamily only two new species are described, both from Tropical Africa. A new genus of the subfamily Proso-pidinæ is here described, and proves to be of exceptional interest.

All types are in the British Museum.

*EUCERA*, Scop.

*Eucera pollinosa*, F. Smith.

*Eucera pollinosa*, Smith, Catal. Hymen. Brit. Mus. ii. p. 294 (1854). ♀.

*Eucera chrysopyga*, Pérez, Actes Soc. Linn. Bordeaux, xxxiii. p. 157 (1879). ♀ ♂.

*Eucera favosa*, Mocq. Termés. Füzetek, iii. p. 240 (1879). ♀ ♂.

Both Dalla Torre and Friese give Smith's species as synonymous with *E. cinerea*, Lep. It is certainly not this species. There is a topotype of *E. pollinosa* in the collection of the late Edward Saunders bearing the label "*E. chrysopyga*, Pérez, det. Friese," and this identification is doubtless correct.

*Eucera nigrilabris*, Lep. (Pérez).

*Eucera nigrilabris*, Lep. Hist. Nat. Insect. Hymen. ii. p. 116 (1841). ♂.

*Eucera numida*, Lep. ibid. p. 117. ♀.

*Eucera terminalis*, F. Smith, Descr. New Spec. Hymen. p. 109 (1879). ♀ ♂.

Pérez redescribes both Lepeletier's species (Actes Soc.

Linn. Bordeaux, xxxiii. p. 171), and these descriptions are reproduced by Friese in 'Bienen Europas,' vol. ii. p. 151.

Smith's *E. terminalis*, from the south of France, is certainly synonymous.

### TETRALONIA, Spin.

#### *Key to the Tropical-African Species of Tetralonia, Spin.*

1. (12) Females.
2. (5) Segments 1-3 of abdomen at least unicolorous, black or fulvous.
3. (4) Segments 1-3 black, 4 and 5 with white pubescence ..... [zibar.)  
*caudata*, Friese. (Zan-
4. (3) Whole abdomen unicolorous fulvous. Length 13 mm. .... [(Nyasaland.)  
*sheffieldi*, sp. n.
5. (2) Segments 1-5 or 2-5 basally with fasciæ of whitish pubescence.
6. (7) Segments 1-5 basally with fasciæ of whitish pubescence; margin of clypeus reddish ..... [(Mozambique.)  
*obscuripes*, Fr.
7. (6) Segments 2-5 basally with fasciæ of whitish pubescence.
8. (9) Large species: length  $15\frac{1}{2}$  mm. .... *neavei*, Vach. (Congo.)
9. (8) Medium species, 9-10 mm.; margin of clypeus yellow.
10. (11) Scopa brownish; tegulæ yellowish brown ..... [E. Afr.)  
*inermis*, Friese. (Germ.
11. (10) Scopa whitish, brown on inner side; tegulæ reddish yellow ..... [(Lake Nyasa.)  
*ottiliensis*, Friese.
12. (1) Males.
13. (16) Antennæ short, scarcely reaching to scutellum.
14. (15) Abdomen with segments 2-5 basally with fasciæ of whitish pubescence. .... [E. Afr.)  
*labrosa*, Friese. (Brit.
15. (14) Abdomen unicolorous fulvous ..... *sheffieldi*, sp. n.
16. (13) Antennæ long, reaching beyond scutellum; labrum normal.
17. (22) Labrum pale, white or yellow or yellow with brown sides. .... [E. Afr.)
18. (19) Labrum white, wings cloudy ..... *inermis*, Fr. (Germ.)
19. (18) Labrum entirely yellow or yellow with brown sides.
20. (21) Labrum entirely yellow, wings hyaline ..... [Fr.)  
*friesei*, n. n. (*fulvicornis*,
21. (20) Labrum yellow, brown laterally; wings subhyaline, subcosta dark .. [Nyasa.)  
*nyassana*, Str. (Lake
22. (17) Labrum black or black with pale centre.
23. (26) Labrum black, wings hyaline.
24. (25) Pubescence pale; tergite 1 and legs densely clothed with black hair.  $10\frac{1}{2}$  mm. .... [geria.)  
*simpsoni*, sp. n. (N. Ni-
25. (24) Pubescence entirely pale ..... *sjöstedti*, Fr. (Kiliman-  
[djar.)
26. (23) Labrum black, whitish in centre; wings cloudy ..... [Nyasa.)  
*ottiliensis*, Fr. (Lake

The specific name "*fulvicornis*" being already in use in this genus for a species described by Morawitz (1895), it has been necessary to rename Friese's species.

*Tetralonia sheffieldi*, sp. n.

♀. Nigra, fulvo-hirta; labro clypeo capiteque post oculos pallide hirsutis; pleuris segmento mediano pedibusque fusco pubescentibus; mandibulis (basi excepto), articulis 4-12 flagelli infra, tegulisque ferrugineis; alis subhyalinis.

Long. 13 mm.

♀. Black, almost entirely covered with fulvous pubescence, long on head and thorax, shorter on abdomen; clypeus, labrum, and the area behind the eyes clothed with white pubescence; pleura, sides of truncation of median segment, and legs clothed with dark fuscous pubescence. Abdominal sternites bare, with sparse apical fasciæ of ferruginous hair. Mandibles apically, joints 4-12 of flagellum, and tegula ferruginous. The whole uniformly covered with medium-sized punctures, sternite 2 with a distinct transversely striate area at base, the area being marked off from the rest of the segment by a bilobed suture. Wings subhyaline.

Length 13 mm.

♂. Similar to ♀; antennæ short for a ♂, barely reaching scutellum.

NYASALAND: Mlanje, iii.-vi. (1913), 5 ♀ ♀, 3 ♂ ♂ (type).

UGANDA PROTECTORATE: Semliki Plains, 2,200 ft., 2 ♀ ♀;

Eastern Mbale District, 3700-3900 ft., 1 ♂. PORTUGUESE

EAST AFRICA: Valley of Kola River, 1 ♀ (*S. A. Nave*).

S. RHODESIA: The Lonely Mine (*Dr. Harold Swale*), 2 ♀ ♀.

Var. ♀. *ferrugineipes*, var. nov.

Formæ typicæ similis, sed differt tibiis tarsisque posticis ferrugineo-pubescentibus.

♀. Similar to the typical form, but differs in having the posterior tibiæ and tarsi clothed with ferruginous pubescence.

5 ♀ ♀.

UGANDA: Entebbe (*C. C. Gowdey*) (type). N. RHO-

DESIA: Demba (*Silverlock Coll.*). BRIT. E. AFRICA: Mar-

sabit (*R. J. Stordy*).

Dr. Harold Swale, who has recently collected specimens of the typical form in Northern Rhodesia, has made some interesting observations on their habits. He writes as follows:—"An interesting bee is the one I send now. It

*Ann. & Mag. N. Hist. Ser. 8. Vol. xiii.*

seems only found in the half-closed yellow flowers of a species of Malvaceæ, which grows about here, a weed with large pale yellow flowers. I seize the flower at the front, closing it up, and listening for a buzz; if I hear it I gather the flower, and put it quietly into a glass-bottomed collecting-box. The bee generally cuts its way through the base of the flower. I was led to look by finding so many blooms with a discoloured hole near the base" (*H. Swale*, in litt., 1914).

*Tetralonia simpsoni*, sp. n.

♂. Nigra; capite, thorace, tergitebus 2-7 fulvo-hirtis; tergite 1 pedibusque dense nigro-hirtis; sterno sternitibus pallide pubescentibus; antennis longissimis ( $10\frac{1}{2}$  mm.), rufis; mandibulis basi, clypeoque luteis; alis hyalinis.

Long.  $10\frac{1}{2}$  mm.

♂. Black; head (except behind the eyes), thorax above, and tergites 2-7 with a dense golden-brown pubescence; behind the eyes, vertex, face, labrum, and sternum clothed with pale hair; tergite 1 and legs with dense black pubescence. Antennæ very long, equal in length to whole insect, joints 3 and 4 of flagellum subequal, all the flagellar joints sinuate. Head broad as thorax, finely punctured; ocelli in a very broad triangle; labrum rather coarsely punctured. Femur iii. without any tubercle and tergite 6 without lateral teeth. Wings hyaline, nervures black. Tegulæ ferruginous.

Length  $10\frac{1}{2}$  mm.

N. NIGERIA (*Dr. J. J. Simpson*). 1 ♂.

A conspicuous species, the dense black basal abdominal segment giving it a distinctive appearance.

*Tetralonia fulviventris*, Sm.

*Tetralonia fulviventris*, Sm. Catal. Hymen. Brit. Mus. ii. p. 308 (1854). ♀.

*Tetralonia exquisita*, Cress. Proc. Acad. Nat. Sci. Philadelphia, p. 213 (1878). ♀.

A ♀ specimen of Cresson's species from Oaxaca, determined by Cockerell, agrees perfectly with Smith's type of *T. fulviventris*, described from a Mexican specimen.

Subfamily PROSOPIDINÆ.

Of remarkable interest is the new genus *Eupalæorhiza* here described. Both Perkins and Cockerell have published notes on the interesting fact that there is sexual dimorphism

in the mouth-parts of the two Prosopine genera *Palæorhiza* and *Meroglossa*. In these two genera the females have the ordinary blunt form of other Prosopidinae, but in the male the apex of the ligula is acute, though the tongue is not of any length. In *Eupalæorhiza*, however, the length of the tongue equals or surpasses that of *Panurgus* and similar forms. Unfortunately the female is unknown, so that no very definite conclusions can at present be drawn from a study of this new and exceedingly interesting species. The following note from Dr. R. C. L. Perkins, whose intimate knowledge of bee-phylogeny adds special weight, is worthy of the attention of all apidologists:—"Should it [*i. e.* the tongue of ♀ *Eupalæorhiza*] prove to be acute, it would still further convince me of the truth of the view that I have held for some time, that the Colletidæ and Prosopidæ have been developed from the Andrenid group (including the Panurgine bees), and are in no ways to be considered as ancestral or primitive forms."

#### EUPALÆORHIZA, gen. nov.

(Type, *Eupalæorhiza papuana*, M.-Waldo.)

General appearance that of a very large *Palæorhiza*, the face being extremely long and narrow between the eyes; the genæ (space between the mandibles and eyes) very long, as long or longer than their apical width. Neurulation as in many *Palæorhiza*. Ligula very long, lanceolate-acuminate, only hairy at the extreme base even under a very strong lens, linear on more than the apical half of its length. In repose the ligula is folded back on the mentum, its apex reaching back to the front of the thorax, and the maxillary blades or laciniae are much too short to cover it. Maxillary palpi 6-jointed, the two basal joints more robust than the third, but elongate, the three apical ones very slender and elongate; labial palpi with four slender elongate joints. Propodeum with the anterior area very clearly defined by a total change of sculpture outside it, as in many *Palæorhiza*, but of very different form, not at all transverse, but forming a subequilateral triangle, instead of being wide and transverse. Abdomen with the seventh dorsal segment emarginate as in *Palæorhiza*, but only five ventral segments are exposed unless the abdomen be distended, the fourth slightly emarginate, the fifth extraordinarily short, concealed beneath the former, and highly modified, strongly emarginate so as to be lobed on each side; its apical portion bent at an angle with the general surface, fringed above with special black hairs directed towards the middle, and beneath these with

pale hairs curving so as to meet medially. Sixth segment exposed, clothed with short hairs, slightly emarginate at the apex, and with a great impression or fovea on each side (like some *Colletes*) ; seventh segment giving off a single narrow process or wing on each side before the apex, the processes beautifully fringed with special curved hairs on the ventral side ; eighth segment with an elongate median apical process. Genital armature with the apical portion of the stipites pilose and marked off (or constricted) from the basal portion, but probably not forming a true lacinia ; sagittæ extending behind these, greatly compressed on their apical half, so that in lateral view this portion forms nearly a semicircle with a small apical production or beak.

*Eupalæorhiza papuana*, sp. n.

♂. Nigra ; mandibulis, genis, pleuris, sterno, scutello apice, postscutello, tegulis, propodeo, segmento mediano, terg. et stern. 1 et 2 sterniteque 3 aurantiacis ; clypeo plerumque, linea intra-orbitali utrinque, pronoti margine linea interrupta, pallide luteis ; alis subhyalinis, apice fuscis.

Long. 13 mm.

♂. Black ; mandibles, cheeks, pleura, sternum, scutellum apically, postscutellum, tegulæ, propodeum, median segment, tergites and sternites 1 and 2, and sternite 3 orange-red ; clypeus for the most part, a line extending along the inner orbits on each side, and an interrupted line on the margin of the pronotum pale yellowish.

The front, clypeus, vertex, propodeum partly, and abdomen shining, the abdomen with small scattered punctures ; thorax dull, opaque, with even and distinct punctures, coarsest on mesonotum. Mandibles as in *Palæorhiza*, toothed. Clypeus with two shallow longitudinal furrows ; a distinct furrow running from base of insertion of antennæ to ocelli. Pubescence, where present, the same colour as chitin on which it is situated, that on head, thorax, and legs short and sparse ; segments 1 and 2 of abdomen destitute of pubescence, the following segments with a considerable covering of long black hairs, chiefly on the apical margin of the segments. Wings golden hyaline, apically fuscous ; stigma well developed, first submarginal cell about twice as long as second, which receives both recurrent nervures.

Length 13 mm.

2 ♂♂.

NEW GUINEA.



This remarkable insect bears a MS. name of P. Cameron's, "*Prosopis papuana*." It is greatly to be regretted that the ♀ of this species is unknown, since we are still in ignorance as to whether the tongue is short and blunt as in that sex of *Palaorhiza* and both sexes of *Prosopis*, &c., or acute as in the ♂ here described.

XLVI.—*The Systematic Arrangement of the Fishes of the Family Salmonidæ.* By C. TATE REGAN, M.A.

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IN a recent synopsis of the families of Salmonoid fishes (Trans. R. Soc. Edinburgh, xlix. 1913, p. 289) I have shown that the Salmonidæ are well distinguished from the Smelts (Osmeridæ), Sil-smelts (Argentinidæ), &c., by osteological characters; perhaps the most noticeable of these is that the vertebræ turn upwards at the base of the caudal fin in the Salmonidæ, but in no other Salmonoids. As thus restricted they form a natural group, confined to the coasts and rivers of the Arctic and North Temperate zones.

After a study of a large series of skeletons, I have arrived at certain conclusions as to the number of genera that may be defined, and as to their natural affinities, which are embodied in the following synopsis:—

*Synopsis of the Genera.*

I. Parietals not meeting in middle line. Teeth well developed in jaws, on vomer and palatines, and in a double series on tongue. Scales small, 19 or more in a transverse series from origin of dorsal fin to lateral line. Dorsal fin short, with not more than 16 rays, 12 or fewer branched. (*Salmoninæ*.)

A. A double or zigzag series of teeth along shaft of vomer, sometimes deciduous in the adult .... 1. *Salmo*, Linn.

B. Teeth only on head of vomer, which has a boat-shaped depression behind it.

Vomerine teeth in a V-shaped or Y-shaped group, separated from the palatine teeth. 2. *Salvelinus*, Nilss.

Vomerine teeth in a curved, nearly semi-circular series that connects the palatine series; mouth large; teeth strong. 3. *Hucho*, Günth.

Vomerine teeth in a transverse series that connects the palatine series; mouth rather small; teeth rather weak .... 4. *Brachymystax*, Günth.

II. Parietals meeting in the middle line. Teeth on vomer and tongue, when present, in several series. Scales larger, 13 or less in a transverse series from origin of dorsal fin to lateral line. (*Coregoninae*.)

A. Dorsal fin short, with not more than 16 rays; teeth very small or absent.

Teeth very small, but distinct, in bands in jaws and on palatines, in a patch on vomer and another on tongue ..... 5. *Stenodus*, Richards.  
Teeth vestigial or absent ..... 6. *Coregonus*, Linn.

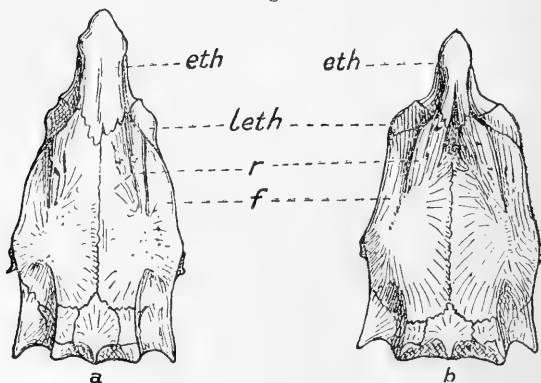
B. Dorsal fin longer, with not less than 18 rays; teeth well developed.  
Mouth rather large; teeth strong ..... 7. *Phylogephyra*, Bouleng.  
Mouth rather small; teeth moderate..... 8. *Thymallus*, Cuv.

The limits and contents of the four genera of the *Salmoninae* are the subject of the following notes:—

### 1. SALMO, Linn.

This genus includes all the fishes commonly known as Salmon and Trout. Examination of the skeletons leaves no

Fig. 1.



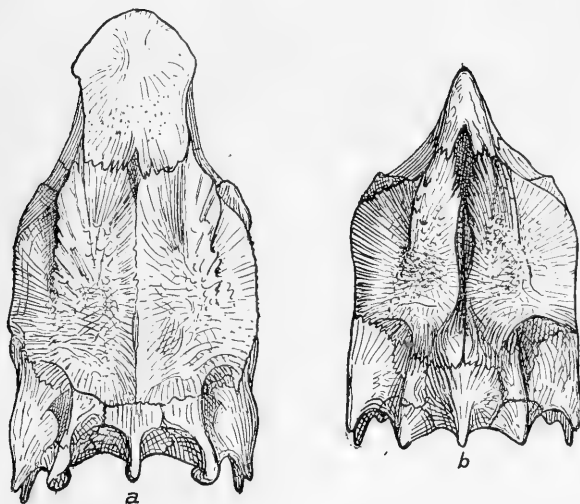
Skulls of **a.** Atlantic Trout (*S. trutta*) and **b.** Pacific Trout (*S. clarkii*), from fish about 9 inches long.

*eth*, mesethmoid; *leth*, lateral ethmoid; *r*, longitudinal ridge;  
*f*, supraorbital flange of frontal bone.

doubt that the Pacific species (Steelhead, Rainbow Trout, Quinmat Salmon, &c.) form a perfectly natural group that differs in several characters from the Salmon and Trout of the Atlantic. The latter are especially distinguished by the large size of the mesethmoid bone, which is not or but

slightly notched posteriorly, and correlated with this the main frontal ridges are wide apart and parallel, whilst the supraorbital flanges are narrow and taper anteriorly. In the Pacific species the mesethmoid is much smaller and is forked posteriorly, the frontal ridges converge anteriorly and the supraorbital flanges are broad. Thus the genus *Oncorhynchus*, Suckley, can be no longer maintained, unless it be considered that the cranial characters warrant its separation from *Salmo*; in that case *Oncorhynchus* will include not only the Pacific Salmon, but the Pacific Trout also. *Oncorhynchus* is said to have a longer anal fin than *Salmo*, but in

Fig. 2.



Skulls of **a.** Salmon (*Salmo salar*) and **b.** Quinnet (*S. quinnet*). As in fig. 1, the skulls are seen from above and the jaws, facial bones, &c., have been removed. The skulls are those of adult fish.

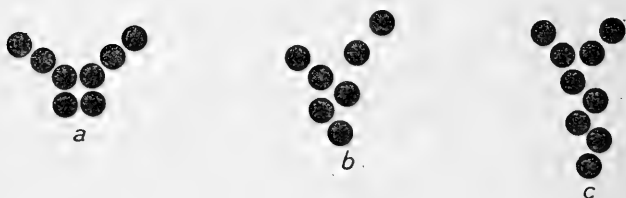
various forms of *S. clarkii* I count 8 to 11 branched rays, and in *S. (Oncorhynchus) masou* 10 to 12, so that there is no generic distinction between these species. Nor is there any justification for Berg's genus *Salmothymus* (Ann. Mus. St. Petersburg, xii. 1907, p. 502), based on *Salmo obtusirostris*, Heck., a species that agrees in its osteology with *S. trutta* and *S. salar*, and may be regarded as the representative of the latter in the rivers of Dalmatia.

## 2. SALVELINUS, Nilss.

The species of Char may be arranged as follows:—

1. *S. alpinus* group.—Head of vomer with posterior process but little developed. Basi-branchial teeth uniserial. No dark spots or markings. Circumpolar.
2. *S. fontinalis* group. Head of vomer with a well-developed posterior process. Basi-branchial teeth absent. Blackish or dark olivaceous spots or markings on back, dorsal, and caudal fins. N. America.
3. *S. namaycush* group.—Head of vomer with a long posterior process. Basi-branchial teeth in a long patch. N. America.

Fig. 3.



Diagrams showing the arrangement of the vomerine teeth in  
a. *Salvelinus perisi*, b. *S. fontinalis*, c. *S. namaycush*.

*S. fontinalis* is so exactly intermediate between the typical Char and *S. namaycush* in the form and dentition of the vomer that I think it best to give up the genus *Cristivomer*, Gill & Jordan.

## 3. HUCHO, Günth.

This genus includes three species:—*H. hucho*, Linn., from the Danube; *H. taimen*, Pall., from Siberia, and *H. perryi*, Brev., from Saghalien and Yesso.

## 4. BRACHYMYSTAX, Günth.

Closely related to *Hucho*. A single species from Siberia.

## XLVII.—Some Additions to the Genera and Species in the Homopterous Family Fulgoridæ. By W. L. DISTANT.

## Fam. Fulgoridæ.

Subfam. *FULGORINÆ*.*Fulgora astarte*, sp. n.

Cephalic process, head, and thorax above piceous, the first finely cretaceously maculate and with its apex pale sanguineous, the thorax above more or less cretaceously pubescent; abdomen, body beneath, and legs brownish ochraceous, the abdominal segmental margins paler; tegmina black, with the veins and numerous reticulations green, the whole surface more or less cretaceously pubescent, with numerous dull testaceous spots with greyish-white margins arranged in five more or less regular transverse series and with a cluster of similar but much smaller spots on the apical area; wings greyish with a slight bluish suffusion, the apical area black; cephalic process measured from angle of apex to eyes a little longer than abdomen, upwardly recurved, its apex robust, but only very slightly dilated.

Length ceph. process, angle from apex to eyes 15–19 mm.; eyes to apex of abdomen 19–23 mm.; exp. tegm. 73–84 mm.

*Hab.* Indo-China, Laokay (*R. Vitalis de Salvaza*, type Brit. Mus.).

Allied to *F. rogersi*, Dist., from the Nicobar Islands, but with the cephalic process longer in relation to the length of the abdomen, and with its apex sanguineous, colour and markings of the tegmina different, &c.

*Euphria consimilis*, sp. n.

Closely allied to *E. dissimilis*, Dist., from Tenasserim (Faun. Brit. Ind., Rhynch. iii. p. 211, 1906), especially by the distinct coloration of the pro- and mesonota, but differing in the wings, which have the apical fourth ochraceous, spotted with white, the face much more strongly carinate, both centrally and marginally; cephalic process extending to about middle of pronotum, in *dissimilis* it extends to the, or near to the, posterior margin; tegmina beneath paler and more sanguineous than in *P. dissimilis*.

Long., excl. tegm., 20–24 mm.; exp. tegm. 62–76 mm.

*Hab.* Indo-China (*A. Vuillet*, type Brit. Mus.).

Subfam. *EURYBRACHYDINÆ*.*Eurybrachys mysorensis*, sp. n.

Head, pronotum, and mesonotum shining olivaceous green; eyes ochraceous; abdomen above sanguineous, with transverse black segmental margins, apically thickly furnished with waxy-white efflorescence; face dark olivaceous green, transversely paler olivaceous green before clypeus, which is blackish; sternum and abdomen sanguineous, the latter with transverse black segmental fasciæ; legs black; tegmina with about basal three-fourths olivaceously virescent, crossed by two paler transverse fasciæ, apical fourth dull greyish green; wings with basal two-thirds sanguineous, apical third greyish white; head (including basal area of face), pronotum, and mesonotum finely obscurely wrinkled, and faintly minutely darkly speckled; rostrum mutilated in type; posterior tibiæ with five spines.

Long., excl. tegm., 9 mm.; exp. tegm. 21 mm.

*Hab.* Mysore; Bababudin Hills (*Bainbrigge-Fletcher*, Brit. Mus.).

*Eurybrachys fletcheri*, sp. n.

Head, pronotum, and mesonotum more or less bright olivaceous green; abdomen above purplish red, apically thickly furnished with waxy-white efflorescence; face emerald-green; clypeus fuscous brown; body beneath and legs purplish red, intermediate and posterior tibiæ blackish; tegmina virescent, more or less obscurely spotted with greyish white, the basal area somewhat emerald-green, remaining area duller and paler, two transverse black fasciate spots near base, not reaching claval area; a transverse greyish-white fascia near apex, preceded by a black spot on inner margin; wings greyish white, with two black apical spots; head moderately concavely excavate between the eyes; posterior tibiæ with five spines.

Long., excl. tegm., 11 mm.; exp. tegm. 25 mm.

*Hab.* Madras Prov.; Shevaroy Hills, 4500 ft. (*Bainbrigge-Fletcher*, Brit. Mus.).

*Eurybrachys rubro-ornata*, sp. n.

Head, pronotum, and mesonotum ochraceous; mesonotum obscurely spotted, its apex and exposed area of metanotum purplish red; abdomen above bright ochraceous, the segmental margins spotted with greyish white; face ochraceous;

clypeus, sternum, and legs purplish red, intermediate and posterior tibiæ black; abdomen beneath bright ochraceous, with central transverse spots and the apex black; tegmina ochraceous, with a large central, basal, longitudinal, purplish-red spot, a subapical greyish transverse fascia united with a brownish apical margin; wings greyish white, with a prominent black spot on upper margin near apex; vertex (including eyes) about as broad as pronotum; face considerably broader than long, the lateral angles subacute; posterior tibiæ with five spines.

Long., excl. tegm., 11 mm.; exp. tegm. 25 mm.

Hab. S. India; Yercaud (T. V. Campbell).

*Messena albifasciata*, sp. n.

Head, pronotum, and mesonotum testaceous, with irregular darker markings; face and clypeus as above, but paler and more brightly marked; abdomen sanguineous; sternum and legs ochraceous, with black markings, tibiæ darker and more or less black; tegmina with about basal two-thirds (not reaching costal margin and narrowed outwardly) testaceous, irregularly marked and spotted with black, the claval area dull ochraceous, spotted and marked with black, remaining area greyish white with the venation ochraceous, a large subapical transverse ochraceous spot with black markings, preceded by two similar spots, but smaller in size, and a submarginal series of small black spots; wings pale fuliginous, the apical area black crossed by an oblique white fascia, the apical margin also white; posterior tibiæ with six spines.

Long., excl. tegm., 9 mm.; exp. tegm. 34 mm.

Hab. Nilgiri Hills; Hillgrove, 4000 ft. (Brit. Mus.).

Allied to *M. sinuata*, Atkins. The specimen was received from Mr. T. Bainbrigge-Fletcher.

Subfam. *DICTYOPHARINÆ*.

*Dictyophara coimbatorensis*, sp. n.

Body and legs virescent; in one specimen the head is wholly ochraceous, in another the apex only is of that colour; tegmina and wings hyaline, the first without any macular markings; head about as long as pro- and mesonota together, slightly narrowed and upturned at apex, the lateral margins strongly ridged; face tricarinate, the lateral carinations converging anteriorly and not extending posteriorly beyond the eyes; clypeus centrally carinate; pronotum and mesonotum tricarinate, posterior tibiæ with four spines.

Long., excl. tegm., 7-9 mm.; exp. tegm. 16-19 mm.

*Hab.* South India; Coimbatore (*Bainbrigge-Fletcher*, Brit. Mus.).

Closely allied to *D. cummingi*, Dist., but with the lateral pronotal carinations less oblique, the face more apically narrowed, different colour, &c.

NEOPUTALA, gen. nov.

Allied to *Putala*, Melich., but differing by having the anterior femora more flattened and dilated, and with a more or less distinct blunt spine near apex.

Type, *N. (Putala) lewisi*, Dist., from Japan.

*Neoputala capitata*, sp. n.

Head and thorax above castaneous brown, a small ochraceous spot at the apex of cephalic process, abdomen above black, the posterior segmental margins, a central longitudinal continuous series of spots, and a number of small linear markings ochraceous; abdomen beneath as above, but without the central longitudinal spots; femora brownish, mottled with ochraceous, their apices a little darker, tibiae ochraceous, the anterior tibiae annulated with brownish; rostrum slightly passing posterior coxæ; head (including cephalic process) about as long as intermediate tibiae, abdomen above more or less distinctly broadly centrally sulcate; anterior femora sulcate beneath, with a distinct blunt spine near apex; head beneath centrally and marginally carinate, the apex of the cephalic process both above and beneath a little convexly broadened and spatulate; tegmina and wings hyaline, very slightly fuliginous, the venation black, tegmina with a large black stigmal spot, a little more than apical third reticulately veined; wings with distinct apical cells.

Long., excl. tegm., 16 mm.; exp. tegm. 22 mm.

*Hab.* Indo-China (*R. Vitalis de Salvaza*, type Brit. Mus.).

AWARAMADA, gen. nov.

Head longly, strongly, porrectly produced, above a little convexly raised and strongly, centrally, longitudinally carinate, lateral margins also carinate, apex truncate, beneath with a small subapical tubercle, the face slightly laterally concavely sinuate, angularly amplified behind eyes, two longitudinal central carinations which are united anteriorly and posteriorly, clypeus robustly centrally carinate; rostrum passing the posterior coxæ; pronotum a little shorter than



mesonotum, the disk straightly tricarinate, strongly deflected on each lateral area, lateral basal margins oblique; mesonotum tricarinate, posteriorly, centrally, angulately produced; abdomen shorter than head, pronotum, and mesonotum together, centrally longitudinally ridged; anterior femora unarmed, posterior tibiæ with three strong spines; tegmina nearly four times as long as broad, apical area with three transverse series of longitudinal cells, clavus without a transverse vein; wings about three-fourths the length of tegmina, with a series of apical and two prominent anteapical cells.

*Awaramada fryeri*, sp. n.

Body and legs fuscous brown, head beneath, sternum, and legs a little paler; tegmina slightly infusate, the venation fuscous brown, the stigma and an apical elongate spot fuscous brown; wings paler than tegmina, the venation and an apical spot fuscous brown; pronotum with some darker punctate spots, posterior angle of mesonotum dull ochraceous; abdomen above mottled with ochraceous; lateral areas of face finely spotted with brown; clypeus with the central carination and the lateral margins pale ochraceous; structural characters as in generic diagnosis.

Long., excl. tegm.,  $12\frac{1}{2}$ – $13\frac{1}{2}$  mm.; exp. tegm. 28–30 mm.

*Hab.* Ceylon; Kandy (*J. C. F. Fryer*, Brit. Mus.).

Subfam. *DERBINÆ*.

Genus PHENICE.

*Phenice*, Westw. Tr. Linn. Soc. Lond. xix. p. 10 (1842)

*Assamia*, Buckt. Ind. Mus. Notes, iv. p. 1 (1896).

*Proutista*, Kirk. Entomologist, 1904, p. 279.

*Sardis*, Kirk. Rep. Exp. Stat. Haw. Plant. Assoc. pt. ix. p. 426 (1906).

*Phenice fritillaris*.

*Derbe fritillaris*, Boh. Vet.-Ak. Handl. 1837, p. 227, t. vii. fig. 8 (1838).

This well-known West-African species has now been received from Nyasaland, Mt. Mlanje, 4000 ft. (*S. A. Neave*, Brit. Mus.).

*Phenice nealei*, sp. n.

Vertex of head and antennæ ochraceous; eyes black; pronotum testaceous, with paler mottlings, the central ridge and posterior margin greyish; pronotum testaceous, the carinations pale ochraceous; abdomen above brownish ochraceous, finely spotted with white, body beneath and legs more

or less ochraceous and finely greyish pubescent; tegmina pale fuscous brown, the venation sanguineous, basal third of costal area and the claval area greyish pubescent, the first also with about four fuscous spots, apical third of costal area, and the apical and posterior marginal areas distinctly spotted with white, the lower central transverse veins distinctly infuscated; wings pale fuscous brown, the central transverse veins infuscated; vertex of head projecting in front of eyes; second joint of antennæ scarcely longer than head; mesonotum convex, somewhat compressed, tricarinate; legs slender, posterior tibiæ with a single spine and with their apices and a subapical annulation black.

Long., excl. tegm., 4 mm.; exp. tegm. 20 mm.

*Hab.* S. Nigeria (*Dr. A. E. Neale*, Brit. Mus.); Gold Coast (*A. B. Evans*, Brit. Mus.).

*Phenice majuscula*, sp. n.

Body above dull dark castaneous; vertex of head ochraceous, pale castaneous at base; mesonotal ridges ochraceous; abdomen above centrally longitudinally ochraceous; sternum testaceous, abdomen beneath dull dark castaneous; legs very pale ochraceous; tegmina fuliginous, mottled with white, costal area white, with the veins there sanguineous, and with large subquadrate fuliginous spots, a large white spot at apex, and a series of smaller white spots on posterior margin; the other white mottlings are irregular, numerous, and discal, and the short transverse veins are distinctly darker fuliginous; wings pale fuscous, the veins darker; antennæ with the second joint short, pale, scarcely as long as head; vertex produced in front of eyes, its lateral margins strongly ridged; mesonotal carinations robust; face long, narrow, its lateral margins strongly ridged; wings about half as long as tegmina.

Long., excl. tegm., 4 mm.; exp. tegm. 25 mm.

*Hab.* Port. E. Africa; Valley of Kola River, near E. Mt. Chipirone, 1500–2000 ft. (*S. A. Neave*, Brit. Mus.).

Genus ZORAIDA.

*Thracia*, Westw. Trans. Linn. Soc. Lond. xix. p. 10 (1842), nom. præocc.

*Zoraida*, Kirk. Entomologist, 1900, p. 242, n. nom.

*Zoraida nyasensis*, sp. n.

Body and legs brownish ochraceous; tegmina pale hyaline, the veins concolorous, costal area fuscous and here the veins

are sanguineous; wings hyaline, the upper veins sanguineous; second joint of the antennæ ochraceous, its apex black, longer than head and pronotum together; vertex of head slightly testaceous, projecting in front of eyes, its apex not bifurcate; mesonotum tricarinate, its apex greyishly tomentose; face narrow, testaceous; tegmina with the apices truncate.

Long., excl. tegm., 5 mm.; exp. tegm. 30 mm.

*Hab.* Nyasaland; Mlanje (*S. A. Neave*, Brit. Mus.).

Allied to the West-African species *Z. sinuosa*, Boh., but excluding the fuscous costal area; the tegmina are entirely hyaline, with the veins concolorous; the veins in the fuscous costal area sanguineous; wings with the costal veins sanguineous, remaining veins concolorous with the hyaline area.

*Zoraida pattersoni*, sp. n.

Body above and abdomen beneath castaneous brown; sternum and legs ochraceous; tegmina fuliginous, the veins darker and moderately spotted with ochraceous, the costal area dark fuliginous, the apical area much paler with the veins greyish, minutely spotted with fuliginous, the apical margin with large fuliginous spots and the marginal area of the apex itself with a double series of small fuliginous spots; before middle of inner margin an oblique pale spot reaching middle of tegmen; wings very pale fuliginous, with the veins darker; antennæ brownish ochraceous, the second joint much longer than head and pronotum together; vertex of head a little projecting beyond eyes, its margins carinate, its apex moderately bifurcate; mesonotum tricarinate.

Long., excl. tegm., 6 mm.; exp. tegm. 30 mm.

*Hab.* Gold Coast; Aburi (*W. H. Patterson*, Brit. Mus.).

Allied to *Z. bohemanni*, Westw., which I have not seen, but a much larger species, tegmina without the sanguineous costal veins, and coloration and markings different.

*Zoraida flavocostata*, sp. n.

Body and legs ochraceous; tegmina very pale brownish ochraceous, with opaline lustre, costal area flavescent, with its basal third of costal margin narrowly blackish, veins black, a small black spot at apex, and a still smaller one above apex of clavus; wings pale ochraceous; antennæ with the second joint flavescent, much longer than head and pronotum together, vertex triangular, moderately projecting in front of eyes, which are black; mesonotum moderately

tricarinate; face long and narrow, about as long as clypeus; wings very small, about as long as apical margin of tegmen.

Long., excl. tegm., 5 mm.; exp. tegm. 32 mm.

*Hab.* Port. E. Africa; Ruw Valley (S. A. Neave, Brit. Mus.).

*Zoraida ugandensis*, sp. n.

Body above pale fuscous brown; vertex of head, pronotum, mesonotal carinations, body beneath, and legs ochraceous; tegmina hyaline, with opaline lustre, the veins very pale ochraceous, most of the short transverse veins, the bases of the longitudinal veins, and a short basal area dark fuliginous, costal area pale stramineous, apices of the veins to apical areas minutely dark fuliginous; wings hyaline, the apices of the veins to apical areas minutely dark fuliginous; second joint of antennæ stramineous, its apex black, considerably longer than head and pronotum together; vertex of head triangular, projecting beyond eyes; face narrow, slightly shorter than clypeus; wings about as long as greatest breadth of tegmen.

Long., excl. tegm., 6 mm.; exp. tegm. 30 mm.

*Hab.* Uganda Prot., Banks of Victoria Nile, near Masindi Port, 3400 ft. (S. A. Neave, Brit. Mus.).

*Zoraida picturata*, sp. n.

Head, pronotum, and mesonotum dull shining ochraceous, the vertex of head and mesonotal carinations a little paler; abdomen darker, with its apex sanguineous; sternum and legs pale ochraceous; face pale ochraceous; clypeus testaceous, its apex black; tegmina hyaline mottled with fuscous, about basal third of costal margin narrowly bright greyish, veins on costal area sanguineous, the principal fuscous markings are linear, longitudinal spots on costal margin, nearly the whole space between the two lower sanguineous veins, three large reversed subtriangular spots beneath the lower sanguineous vein, two apical transverse series of small spots, pale mottlings on lower half, and posterior marginal spots; wings very pale fuliginous, a small dark discal spot and another on posterior margin; vertex triangular, projecting beyond eyes, which are castaneous; face narrow, shorter than clypeus; second joint of rostrum ochraceous, longer than head and pronotum together; mesonotum moderately tricarinate; wings about half the length of tegmina.

Long., excl. tegm., 4 mm.; exp. tegm. 24 mm.

*Hab.* Nyasaland; Mt. Mlanje (S. A. Neave, Brit. Mus.).

*Zoraida evansi*, sp. n.

Head, pronotum, and mesonotum ochraceous, vertex of head and mesonotal carinations paler; abdomen pale testaceous with darker mottlings, its apex ochraceous; sternum and legs ochraceous, the first more or less greyishly pilose; tegmina pale greyish, subhyaline, the veins brownish ochraceous, costal area with a long basal longitudinal brownish spot containing an upper greyish line, a large subapical brownish spot containing four or five prominent smaller greyish spots, a central discal spot with a small internal grey spot, and a series of small brown spots on the posterior and apical margins; the smaller transverse veins are also distinctly fuscous; wings pale fuliginous, the veins brownish, a small dark spot on anal area, which is greyish; second joint of antennæ ochraceous, much longer than head and pronotum together; vertex triangular, projecting in front of eyes; face narrow, shorter than clypeus; mesonotum rather prominently tricarinate; wings about half the length of tegmina.

Long., excl. tegm., 3 mm.; exp. tegm. 22 mm.

*Hab.* Gold Coast (*A. E. Evans*, Brit. Mus.).

*Zoraida vuilleti*, sp. n.

Body pale fuscous; legs very pale ochraceous; mesonotal carinations obscurely greyish; tegmina hyaline, the veins fuliginous, base, costal area, and apex irregularly piceous, the first containing about four hyaline spots, the costal margin some five small opaque pale spots near apex, and a large hyaline spot at apex containing three or four brownish dots, posterior margin narrowly fuscous; wings pale fuliginous, the veins fuscous; second joint of antennæ fuscous, its apex paler, much longer than head and pronotum together; vertex triangular, the apex broad, projecting beyond eyes; face narrow, about as long as clypeus; wings slightly passing apex of tegminal clavus.

Long., excl. tegm., 4 mm.; exp. tegm. 22 mm.

*Hab.* Indo-China (*A. Vuillet*, type in Brit. Mus.).

*Zoraida histrionica*, sp. n.

Vertex and pronotum pale ochraceous, the latter with two central oblique black lines; mesonotum pale brownish, with narrow margins and fasciate carinal markings pale ochraceous; scutellum purplish brown, with a central longitudinal greyish line; abdomen ochraceous, above thickly mottled

with castaneous, beneath more or less broadly segmentally fasciated with that colour; sternum and legs ochraceous; tegmina hyaline, the venation fuscous, costal area flavescent, containing a piceous spot beyond middle and another near apex, apical margin narrowly piceous, and with a piceous spot at apex of clavus; wings slightly tinted with ochraceous; second joint of antennæ ochraceous, its apex testaceous, considerably larger than head and pronotum together; vertex triangular, slightly projecting beyond eyes; wings very small, about as long as apical margin of tegmina; face narrow, about as long as clypeus.

Long., excl. tegm., 5 mm.; exp. tegm. 25 mm.

*Hab.* East Himalayas (Brit. Mus.).

This species is allied to *Z. ephemeralis*, Walk., from the Papuan Islands.

#### *ZORAIDOIDES*, gen. nov.

Head much narrower than pronotum, vertex narrow, its lateral margins prominently ridged, their apices subacute; eyes large, obliquely directed along the lateral margins of the pronotum; face long, narrow, the lateral margins strongly ridged and slightly undulate, divergent before the clypeus, which is tricarinate and only slightly shorter than the face; antennæ with the second joint very long, longer than the head and pronotum together; pronotum short, centrally tricarinate, the lateral areas extending backwardly and obliquely over the lateral margins of the mesonotum, its margins ridged; mesonotum obscurely tricarinate; abdomen short and robust; legs slender, posterior tibiæ with a distinct spine; tegmina elongate, more than three times longer than broad, their apices subtruncate, five costal areas, four central basal areas, a series of twelve areas from apex to posterior inner margin, and two central subapical areas (the outermost small) beneath the fifth costal area; wings very short, somewhat imperfect in the unique typical specimen.

#### *Zoraidoides malabarensis*, sp. n.

Body castaneous; eyes black; central carinations to mesonotum and macular markings to pronotum pale ochraceous; face pale ochraceous, spotted with castaneous; second joint of antennæ dull ochraceous, its apex pale testaceous; legs greyish white; tegmina and wings hyaline, the first with the costal marginal area ochraceous, excepting above the first and second costal areas, where it is hyaline, veins obscure ochraceous; wings with the veins brownish ochraceous; structural characters as in generic diagnosis.

Long., excl. tegm., 5 mm. ; exp. tegm. 26 mm.

*Hab.* Malabar ; Taliparamba (*T. B. Fletcher*, Brit. Mus.).

'This specimen was found on "Pepper."

### Genus DIOSTROMBUS.

*Diostrombus*, Uhler, Proc. Nat. Mus. U.S. 1896, p. 283 ; Muir, Bull.

Exp. Stat. Haw. Plant. Assoc. 1913, p. 80.

*Drona*, Dist. Faun. Brit. Ind., Rhynch. iii. p. 305 (1906).

Type, *D. politus*, Uhler (from Japan).

Mr. Muir states that he has seen a cotype of *Diostrombus* from the U.S. Nat. Museum, and has found it congeneric with my *Drona*. I accept his decision, and amend the nomenclature accordingly. The species I now know are:—

*D. politus*, Uhler. Japan.

*D. carnosus* (*Derbe*, *Phenice*?), Westw., and *D. (Drona) pennatus*, Dist. Brit. India.

The Ethiopian species are as follows:—

*D. (Derbe) lanius*, Stål. Caffraria.

*D. (Drona) grahami*, Dist. Ashanti ; Nyasaland, Mt. Mlanje (*S. A. Neave*).

*D. (Thracia) apicalis*, Hagl. Congo.

*D. gowdeyi*, Dist. Uganda.

### *Diostrombus gowdeyi*, sp. n.

Body shining black ; eyes and posterior margin of mesonotum ochraceous ; abdomen above and body beneath more or less cretaceously tomentose ; legs ochraceous, the femora, apices of tibiæ, and the tarsi piceous ; tegmina and wings hyaline, slightly tinted with brownish ochraceous, venation black or piceous ; vertex moderately produced in front of eyes, the apex bifurcate ; face narrow, laterally ridged ; clypeus large, tricarinate, the lateral carinæ somewhat obscure ; mesonotum large, convex, smooth, glossy, non-carinate ; abdomen in the male furnished apically with a pair of long forceps-like anal appendages ; tegmina with the costal membrane possessing three oblique transverse veins on its apical half, upper ulnar area with a transverse vein near middle ; second joint of antennæ about as long as head.

Long., excl. tegm., 4–4½ mm. ; exp. tegm. 19–22 mm.

*Hab.* Uganda (*C. C. Gowdey*, Brit. Mus.).

*Phra pictipennis*, sp. n.

Body above pale tawny brown; mesonotum with two central linear fasciæ and a large spot on each lateral area dull castaneous brown, margins narrowly greyish white; body beneath and legs pale ochraceous, base of abdomen black where the segmental margins are greyish white; tegmina pale, creamy semihyaline, much mottled with very pale fuscous, three or four linear longitudinal black spots in costal area, apical veins more or less suffused with blackish, three rounded black spots on basal third and three blackish spots on inner margin; wings white, semihyaline, the veins darker.

Allied to *P. amplificata*, Dist., from Ceylon, but with the vertex of head slightly shorter and considerably more concave; the amplified mesonotal margins much broader and less spinous, markings of the tegmina distinct, &c.

Long., excl. tegm.,  $3\frac{1}{2}$  mm.; exp. tegm. 18 mm.

Hab. U. P. Brit. India, Bankatti (*A. D. Imms*, Brit. Mus.).

“Under bark and in rotten wood of standing Sal.”

Subfam. *RICANIINÆ*.*Pochazia pipera*, sp. n.

Head and pronotum brownish ochraceous, mesonotum black, exposed margins of metanotum ochraceous; abdomen testaceous; body beneath and legs ochraceous; tegmina pale bronzy brown, two pale transverse lines before apex and a much inwardly angulated line near middle, from this line to base the surface is much mottled with small paler and darker spots, a small black spot near apical angle and a subtriangular pale spot near apex of costal membrane; wings very pale bronzy brown; mesonotum with five carinate lines, the central one straight, on each side of which is an inwardly and anteriorly curved line which bifurcates near middle; apical margin of tegmina larger than inner margin; face broad, centrally carinate, the carination becoming almost obsolete towards clypeus; posterior tibiæ with two spines.

Long., excl. tegm., 6 mm.; exp. tegm.  $19\frac{1}{2}$  mm.

Hab. Malabar Distr., Taliparansbas (*T. Bainbrigge-Fletcher*, Brit. Mus.).

“On Pepper plant.”



Subfam. *FLATINÆ*.*Pulastya abbreviata*, sp. n.

Body more or less virescent (ochraceous in faded specimens); legs pale ochraceous; tegmina pale virescent or pale ochraceous, the apical third of costal margin, the whole of apical margin, and the greater part of posterior margin very narrowly but closely spotted with brownish; wings creamy white; head moderately conically produced; pro- and mesonota longitudinally tricarinate; tegmina about twice as long as broad, the posterior angle not or scarcely angulately produced.

Long., excl. tegm., 8-9 mm.; exp. tegm. 23-25 mm.

*Hab.* Indo-China (*R. Vitalis de Salvaza*, type in Brit. Mus.).

Allied to *P. acutipennis*, Kirby, from Brit. India, but differing by the non-produced posterior angles of the tegmina.

*Satapa tuberculosa*, sp. n.

Body and legs dull dark ochraceous; mesonotum fuscous brown; abdominal segmental margins and lateral areas of sternum greyishly tomentose; tegmina pale tawny brown, two prominent dark spots on costal membrane and another near apex, the apical half much mottled with darker markings, the costal membrane finely granulose near base, a median series of granules, and about three distinct tubercles a little before middle, one also on the claval area; wings pale fuliginous, the venation darker.

Long., excl. tegm.,  $5\frac{1}{2}$  mm.; exp. tegm. 13 mm.

*Hab.* S. India; Coimbatore (*T. Bainbrigge-Fletcher*, Brit. Mus.).

Allied to *S. sicula*, Dist., from Ceylon, but differing in the tuberculated tegmina, the posterior angles of the tegmina more produced, &c.

## PARAGOMEDA, gen. nov.

Head longer than breadth between eyes, narrowed anteriorly; face considerably longer than broad, obliquely narrowed at base, centrally carinate; pronotum shorter than vertex, centrally finely carinate, its lateral margins laminate; mesonotum tricarinate; tegmina about twice as long as broad, with the costal membrane very strongly arched and convex, moderately sinuate before apex, apical margin truncate, the apical and posterior angles not rounded, posterior

margin slightly sinuate, costal membrane scarcely or very little wider than radial area, venation generally as in *Gomeda*; wings very little broader than tegmina.

Allied to *Gomeda*, Dist., but separated by the different-shaped and more produced vertex of head, the strongly arched and convex costal membrane, and the angulate apical and posterior tegminal angles, &c.

Type, *P. typica*, Dist.

*Paragomeda typica*, sp. n.

Body above and beneath ochraceous, the legs paler, the abdomen above basally and apically cretaceously tomentose; tegmina pale ochraceous, sparingly spotted with brownish, the apical cells brownish, preceded by a similar series of transverse brownish spots; wings creamy white; structural characters as in generic diagnosis.

Long., excl. tegm.,  $4\frac{1}{2}$  mm.; exp. tegm.  $12\frac{1}{2}$  mm.

Hab. S. India; Nandidrug (*T. V. Campbell*, Brit. Mus.).

*Paragomeda viridis*, sp. n.

Head, pronotum, and mesonotum virescent; abdomen, body beneath, and legs ochraceous; tegmina virescent, the margins very narrowly pale ochraceous, the apical margin minutely spotted with pale brownish, and a few scattered minute brownish spots on disk; wings creamy white; vertex only slightly longer than pronotum, which is centrally carinate; mesonotum tricarinate.

Long., excl. tegm.,  $3\frac{1}{2}$  mm.; exp. tegm.  $12\frac{1}{2}$  mm.

Hab. S. India; Nandidrug (*T. V. Campbell*).

A single carded specimen of this species allows no further description than the above.

*Atracis clypeata*, sp. n.

Body above pale greenish ochraceous; vertex with two small spots at apex and the lateral margins near eyes black; mesonotum with somewhat large linear black spots forming two broken anteriorly converging fasciæ; abdomen above with two dark basal spots and three pale greenish longitudinal fasciæ, one central, the other two lateral; face with some small black marks near anterior margin, clypeus with two central brown fasciæ united posteriorly; legs ochraceous; tegmina opaque, greyish, with a slightly greenish tint, a few small black spots near base, and some other

mostly linear on apical area, the veins greenish ochraceous; wings creamy white, the veins greenish ochraceous; vertex about as long as the pronotum, centrally longitudinally incised, foveate, with the lateral margins strongly recurved; lateral margins of the pronotum moderately recurved; face longer than broad, narrowed anteriorly, lateral margins strongly recurved; tegmina with the costal membrane about three times as wide as radial area.

Long., excl. tegm., 11 mm.; exp. tegm. 32 mm.

*Hab.* Ceylon (*J. C. Fryer*, Brit. Mus.).

*Atracis nalandensis*, sp. n.

Body above dull brownish mottled with darker markings, the mesonotum with two discal, longitudinal, anteriorly converging black fasciæ; abdomen with two basal excavated black spots; face and clypeus somewhat more palely ochraceous, the first with its anterior area more or less speckled with black; tegmina ochraceous, irregularly speckled and spotted with black (these markings vary in different specimens); wings pale fuliginous, a little paler on central area; vertex about as long as pronotum, distinctly foveate, the lateral margins strongly recurved; pronotum with the lateral margins also strongly recurved; face considerably longer than broad, narrowed anteriorly, the lateral margins strongly recurved; clypeus finely, darkly, transversely striate; tegmina with the costal membrane more than twice as broad as radial area.

Long., excl. tegm., 12 mm.; exp. tegm. 33 mm.

*Hab.* Ceylon; Nalanda (*Atkins Coll.*, Brit. Mus.). Assam; Margherita (*Doherty*).

*Atracis dissimilis*, sp. n.

Body above greenish ochraceous; abdominal segmental margins a little paler; legs ochraceous; tegmina greyish ochraceous, opaque, with some small ill-defined darker spots, of which the largest are two in vertical series near base and another on apical area; wings creamy white; vertex slightly longer than pronotum, strongly, centrally, longitudinally incised, the lateral margins recurved; pronotum centrally longitudinally ridged, the lateral margins recurved; mesonotum somewhat crushed and mutilated in typical specimen; abdomen above centrally longitudinally carinate; face with the apex distinctly darker, centrally longitudinally carinate, longer than broad, the lateral margins moderately convex and

recurved; clypeus with brownish oblique striations on each lateral area; tegmina with the costal membrane three times as broad as radial area.

Long., excl. tegm., 11 mm.; exp. tegm. 28 mm.

*Hab.* S. Mysore; Goorghalli Estate (*Bainbrigge-Fletcher*, Brit. Mus.).

# XLVIII.—*Descriptions and Records of Bees.*—LVIII.

By T. D. A. COCKERELL, University of Colorado.

## *Anthophora curta*, Provancher.

El Paso, Texas, at yellow flowers of a species of *Compositæ*, Nov. 7, 1913, 4 ♀ (*P. H. Timberlake*, 2).

Of these, two are typical *curta*, while two have the hair on inner side of hind basitarsi rather dark ferruginous. These latter are clearly *curta*, not *A. peritomæ*.

## *Tetralonia poetica*, sp. n.

♂.—Length about 12 mm.

In my table in *Trans. Amer. Ent. Soc.* xxxii. p. 79, runs out at 4, because yellow of clypeus is not notched at sides; except for this character it runs to *T. frater* (Cress.) on p. 80, to which it is very closely allied. It differs from *T. frater* (a co-type from Colorado compared) by the clypeal yellow being pale lemon instead of almost orange, its upper border arched, leaving the upper and lateral margins of the clypeus broadly black; face broader; hair of thorax above more strongly ochreous; apical plate of abdomen broader; last ventral segment with the oblique submarginal ridges straight or nearly (curved in *frater*), and apical corners of segment prominent (not so in *frater*).

I thought this might be the male of *T. virgata* (Ckll.), but the b. n. in *virgata* squarely meets the t.-m., whereas in *poetica* it falls short of it.

*Hab.* Whittier, California, at flowers of *Convolvulus*, April 14, 1912, 3 ♂ (*P. H. Timberlake*, 3).

## *Perdita hypoxantha*, sp. n.

♂.—Length  $3\frac{1}{2}$ –4 mm.

Very close to *P. gutierreziae*, Ckll., differing as follows:—Upper level of yellow on front practically straight, except a

small notch for the foveal spot on each side; cheeks with the lower three-fourths entirely yellow; pleura yellow, except its broad upper margin; abdomen much darker, with successively narrower yellow bands on a dark brown ground; anterior and middle tibiae each with a brown stripe, and there may be a small brown mark at apex of middle femora.

*Hab.* Idyllwild, San Jacinto Mts., California, abundant at flowers of *Adenostoma fasciculatum*, July 14, 1912 (*P. H. Timberlake*, 1).

The plant is Rosaceous, but the bee is related to the species occurring on flowers of Compositæ.

*Halictus ovaliceps*, Cockerell.

Whittier, California, April 16, 1913, 2 ♀; one at flowers of *Rubus vitifolius*, collecting cream-coloured pollen; one at flowers of *Phacelia hispida*, collecting light blue pollen (*P. H. Timberlake*, 5).

*Nomada harimensis*, sp. n.

♂.—Length 7 mm.

Head and thorax black, densely rugoso-punctate, with thin white hair, which is greyish white dorsally, but pure white on cheeks, middle of face, and underside of thorax; head broad; mandibles simple, red except basally; clypeus all black, but lower corners of face shining yellow; antennæ long and thick; scape swollen, black; flagellum black, bright ferruginous beneath except the last three joints; third antennal joint much shorter than fourth; tubercles and tegulæ ferruginous, thorax otherwise black; scutellum not very prominent. Wings clear, with the apical margin brown; stigma ferruginous, nervures fuscous; b. n. going a short distance basad of t.-m.; first r. n. joining middle of second s. m. Legs ferruginous, black basally; femora black except apex and about apical two-thirds above; tibiae with a black patch behind; anterior coxæ with a red apical spot, but not spined. Abdomen shining, without evident punctures; first segment piceous, with a curved, bilobed, transverse red band on disc; second and third segments broadly piceous apically, otherwise yellow except in middle, where they are ferruginous; fourth segment similar, except that the yellow is reduced and the apical margin is ferruginous; apex ferruginous, the apical plate broad and entire; venter only slightly marked with yellow.

♀.—Length about 7 mm.

Robust, bright ferruginous marked with black, no yellow anywhere; middle of mesopleura covered with a patch of silvery-white hair, sides of metathorax below with similar patches; head red, with supraclypeal area, front except sides, ocellar region, and cheeks except a band along posterior orbits all black; antennæ long, bright ferruginous, the last joint very clear red, but the one before it strongly blackened, contrasting, and the two joints before this more or less dusky; third antennal joint shorter than fourth; mesothorax with a broad median black band. Legs red, the middle and hind coxæ marked with black, hind tibiæ slightly dusky behind. Apex of wings dark brown. Abdomen shining chestnut-red, without evident punctures, and with no yellow markings; first segment with a large black patch, lobed at sides, second segment broadly blackened apically, fifth with an interrupted black basal band.

*Hab.* Harima, Japan (*Fukai*). U.S. National Museum. The male (=type) taken April 7, 1912, the female April 18, 1912.

This is not very close to any described Japanese species. In Schmiedeknecht's tables (*Apidae Europææ*) the male runs nearest to *N. ruficornis*, L., which is much larger, and differs in face-markings and colour of scape. The female runs to *N. thersites*, Schm., which is evidently closely allied, differing from *harimensis* by the black markings on the femora, markings of abdomen, &c.

*Nomada luteola*, Lepeletier.

East Falls Church, Virginia, May 4, 1913 (*Rohwer and Cockerell*).

*Megachile melanophæa*, Smith.

Chazy Lake, N.Y., June 28, 1913, ♂ (*Felt*).

*Megachile nipponica*, n. n.

This name is proposed for *M. orientalis*, Pérez, 1905 (not of Morawitz, 1895), from Yokohama, Japan.

*Megachile harimensis*, sp. n.

♀.—Length about 11 mm.

Black, robust, with fulvous, white, and black hair; facial quadrangle longer than broad; mandibles quadridentate; clypeus shining, closely and strongly punctured, the lower edge subemarginate in middle; antennæ entirely black;

face, front, cheeks, and occiput covered with pale ochreous hair, paler and dense at sides of face, on vertex fulvous, with some fuscous laterally; mesothorax and scutellum densely punctured but glistening, covered with bright fulvous or fulvo-ferruginous hair; other parts of thorax with paler, ochreous-tinted hair, becoming dull white beneath; tegulæ bright ferruginous. Wings pale brownish, nervures piceous. Legs black, with pale hair, red on inner side of middle and anterior tarsi, but reddish black on inner side of hind ones; middle basitarsi with reddish hair on outer side; joints 2 to 4 of middle tarsi broadened; spurs pale ferruginous. Abdomen broad and short, shining, punctured, not at all metallic; basal segment and sides of second with much pale ochreous hair; hind margins of segments 3 to 5 with thin pale hair-bands, the discs of these segments, especially at sides, having black hair (the third segment has pale hair in middle); sixth segment gently concave in lateral profile, almost bare, with no light hair; ventral scopa long, creamy white, black on last two segments and at sides of the one before.

*Hab.* Harima, Japan, May 1912 (*Fukai*, 45). U.S. National Museum.

In Friese's table of Palearctic *Megachile* this runs to *M. picicornis*, except as to the antennæ. In his table of Oriental species it runs to 29, but is not either of the species there indicated. It does not appear to be very close to any recorded Japanese or Chinese species. Superficially *M. harimensis* looks just like a rather small *M. circumcincta*, but on closer examination it is seen to differ in many ways.

*Megachile vagata*, Vachal.

Argentina (*Fitzgerald*; British Museum, 99. 124). 1 ♂.

This specimen is about 10 mm. long, but otherwise agrees with Vachal's description. The anterior femora and tibiæ are red on the outer side; the spines on anterior coxæ are small. The species is allied to *M. jenseni*, Friese.

*Megachile dentipes*, Vachal.

Argentina (*O. W. Thomas*; British Museum, 1904. 148). 1 ♂.

Vachal's description sufficiently indicates this striking species, with extraordinary anterior tarsi, and the middle femora sharply toothed beneath in the middle. The following may be added:—Mandibles with a large red patch; labrum dull testaceous; fringe of hair on inner border of anterior

basitarsus appearing black in some positions, but really largely pale straw-colour; anterior coxæ with a short band of red bristles in front; coxal spines long; greater part of anterior femora light red.

*Megachile mendozana*, Cockerell.

Argentina (O. W. Thomas; Brit. Museum, 1904, 148).

1 ♂.

This species was described from the female as *cornuta*, Sm., and *rhinoceros*, Friese, both preoccupied names. The insect before me is certainly the male of *rhinoceros* as described by Vachal; it also runs to *rhinoceros* in Friese's table of Argentine *Megachile*, and to *mendozana* in Jörgensen's Mendoza table. It is, however, smaller than the size given by Friese for male *rhinoceros*, and the mesothorax is more shining, with the punctures conspicuously larger and less dense than in a female *rhinoceros* from Mendoza now before me. There are perhaps two species at present confused by authors under *mendozana* or *rhinoceros*.

*Megachile parsonsiæ*, Schrottky.

Argentina (O. W. Thomas; Brit. Museum, 1904, 148).

This agrees with Friese's brief account of "*simillima*" from Mendoza, which Jörgensen says is to be called *parsonsiæ*. The pallid anterior tarsi have an elongated black spot on the inner side, and the keel of the sixth abdominal segment has six sharp spines.

*Megachile porrectula*, n. n.

A new name is required for *M. acuta*, Vachal, 1908 (not *M. acuta*, Smith), from Mapiri, Bolivia.

*Megachile paraxanthura*, sp. n.

♂.—Length a little over 9 mm.

Black, the flagellum very obscure brownish beneath; legs black, the last tarsal joint red at extreme apex, anterior femora with the smooth area which touches the tibiæ (when the legs are flexed) red; mandibles with a triangular tooth at base beneath; face densely covered with cream-coloured hair; rest of head and thorax with dull white or yellowish-white hair, mixed with long black hairs on vertex, scutellum, and especially postscutellum; head and thorax above closely



and finely punctured; tegulæ piccous. Wings dusky, the costal region strongly brownish; nervures sepia. Legs with pale hair; anterior tarsi simple; anterior coxæ with spines of moderate size, the face of the coxa above the spine shining, with no special ornamentation; spurs yellowish white. Abdomen short, first segment with long hair like that of thorax; second to fifth with entire ochreous hair-bands, rather thin on second, dense on the others; discs of second to fourth with very short fuscous hair, only seen in lateral view; nearly basal two-thirds of fifth segment covered with conspicuous ochreous tomentum; sixth segment above densely covered with golden-ochreous hair, but the margin of the keel bare; keel of sixth segment strongly emarginate in middle, but the edges of the emargination not dentiform, the margin on each side of the notch may be indented, but is not at all dentate; no evident ventral spines. There is no hair-band in the scutello-mesothoracic suture.

*Hab.* Argentina (*O.W. Thomas*; Brit. Museum, 1904. 148).

In Jörgensen's Mendoza table and Friese's Argentine table this runs to "*simillima*" = *parsonsiæ*, which is really a very different species. In Vachal's table of male *Megachile* it falls nearest to *M. pallefucta*, but it is not that species, nor is it *brasiliensis*, near to which it falls in Friese's table of species of the Brazilian subregion. It does not agree with any description I can find, but it may possibly have been described from the female.

### *Megachile abluta*, Cockerell.

♂.—Los Baños, Philippine Is. (*Baker*, 1792, 1793, 1796); Mt. Makiling, Luzon (*Baker*, 1795).

I am surprised to find that I cannot separate this species from *M. abluta*, described from Formosa. It has very possibly been spread by man, the nests being easily carried in timber or merchandise. The mesothorax of the Philippine Islands specimens is less hairy than that of the Formosan examples before me, but the character varies, and it is impossible to draw any specific lines. The species is easily known from *M. laticeps*, Sm., by the spined coxæ.

A male of *M. abluta* was sent by Professor Baker with a female *Megachile*, which has received a manuscript name from Friese. I find, however, another male from Los Baños which, though allied to *abluta*, is distinct, and evidently belongs with Friese's new species.

*Megachile laticeps*, Smith, var. *a*.

♂.—Los Baños, Philippine Is. (*Baker*, 1790).

This exactly agrees with Smith's account, except that it is fully 11 mm. long, the hair on the cheeks is only faintly tinged with yellow, and the first four abdominal segments have entire fulvous hair-bands. Unless Smith's type was in poor condition, my insect must represent a distinct variety, but, I think, not a distinct species.

*Megachile perihirta*, Cockerell.

♂.—Los Angeles County, California (*Coquillett*). U.S. Nat. Museum. Denver, Colorado, Aug. 25 (*Mrs. C. Bennett*).

*Megachile sidalceæ*, Cockerell.

♂.—Del Rio, Texas, May 1, 1907, at flowers of *Monarda citriodora* (*Bishopp*). U.S. Nat. Museum.

*Megachile pereximia* (Cockerell).

*M. vallorum*, Ckll., is no doubt the female of *pereximia*. The type of *pereximia* has the first r. n. entering second s.m. as far from base as second from apex, and has the fringe on inner side of anterior basitarsus mainly black. These characters vary in Texan specimens; some from Cotulla and Denton have the first r. n. exactly meeting first t.-c., and in these the fringe on inner side of anterior basitarsus is light red, only black at base. These also are smaller than the type. However, one from Cotullo is as large as the type, and a Denton male has the first r. n. entering second s.m., though not so far from base as in type.

The following records relate to material from Texas :—

- (1) Males (*pereximia*).—Cotulla, May 11, at *Monarda punctata* and *Verbesina encelioides* (*Crawford*); Cotulla, May 5, at *Coreopsis* (*Crawford*); Denton, May 29, at *Gaillardia pulchella* (*Bishopp*); Dallas, at *Amorpha fruticosa*, May 9 (*Bishopp*); Dallas, at *Gaillardia pulchella*, May 19 (*Bishopp*); Dallas, July 1, hair of face cream-colour (*Bishopp*); Paris, May 24 (*Bishopp*); San Antonio, at *Coreopsis cardaminefolia*, May 4 (*Crawford*); New Boston, at *Tetra-neuris linearifolia*, Aug. 29 (*Bishopp*); Victoria, at *Helianthus*, April 26 (*Bishopp*); Stringtown, Sept. 7 (*Bishopp*); Calvert, April 5 (*Jones*); Kerrville, at

*Marrubium vulgare*, April 12 (*Pratt*); Devils River, at *Gaillardia pulchella*, infested with many mites, May 6 (*Bishopp*). Also from Daleville, Arkansas, Sept. 13 (*Jones*).

- (2) Females (*vallorum*).—San Diego, at *Opuntia*, April 24, large variety (*Mitchell*); Plano, June, Aug. (*Tucker*); Paris, on cotton, unusually large, with a very few black hairs on clypeus (*Jones*); Hearne, at nests in bogs, July 23 (*Bishopp*); Dallas, at *Gaillardia*, June 10 (*Bishopp*); Dallas, at *Engelmannia pinnatifida*, May 22 (*Pierce*); Laredo, Oct. 21 (*Mitchell and Bishopp*); Riverside, Aug. 24 (*Yothers*); Wolfe City, June 16 (*Bishopp*); Devils River, at *Monarda citriodora*, May 3 (*Pratt*); Pittsburg, May 9 (*Bishopp*); Kerrville, at *Coreopsis cardaminefolia*, June 2 (*Pratt*); Kerrville, at *Salvia pitcheri*, no pollen collected, June 19 (*Pratt*); San Antonio, at *Coreopsis cardaminefolia*, May 14 (*Crawford*); Denton, at *Coreopsis cardaminefolia*, May 19 (*Bishopp*); Arlington, at *Sideranthus*, Aug. 28 (*Bishopp*); Barstow, July 22 (*Crawford*); Austin (*Crawford*). Also at Daleville, Arkansas, Sept. 13 (*Jones*).

*Megachile perbrevis*, Cresson.

Males from Texas carry the following data:—Devils River, at *Gaillardia pulchella*, May 3 (*Bishopp*); Victoria, Aug. 20 (*Mitchell*); Victoria, March 6 (*Leister*).

*Megachile perbrevis onobrychidis* (Cockerell).

My *M. onobrychidis* is only a race of *perbrevis*. The following localities for it are new:—

Oak Creek Cañon, Arizona, 6000 ft., July (*Snow*); Douglas County, Kansas, 900 ft. (*Snow*); Mound, La., May 12 (*Jones*); Dallas, Tex., Sept. 4 (*Bishopp*); Greenville, Tex., Sept. 24 (*Bishopp*); New Boston, Tex., Aug. 30 (*Bishopp*); Rosser, Tex., April 15 (*Bishopp*). These are all males.

*Megachile subexilis*, Cockerell.

♀.—Rito de los Frijoles, New Mexico, Aug. (*W. W. Robins*).

Typical as to structure, but abdominal bands faintly creamy.

*Megachile campanulæ* (Robertson).

♀.—Indiana. Collector unknown.

*Megachile exilis*, Cresson.

The following localities are in Texas:—Grand Prairie, at *Ambrosia psilostachya*, June, ♂ (*Jones*); Rosser, June 7 (*Jones*); Runge, Sept. 20 (*Crawford*); Victoria, April 17, ♂ ♀ (*Leister*); Del Rio, May 8 (*Bishopp*); Cotulla, May 12 (*Crawford*); Kerrville, at *Monarda citriodora*, May 31, eleven females (*Pratt*). It also occurs at Durant, Okla., at *Asclepias*, one carrying a pollen mass on hind leg (*Bishopp*); and in Arkansas at Daleville, Aug. 13 (*Jones*), and Fouke, at *Verbesina helianthoides*, May 22, ♂ (*Bishopp*).

*Megachile fidelis*, Cresson.

Los Angeles, California; nine females, Aug. (*Coquillett*).

*Megachile vidua monardarum* (Cockerell).

♂.—Longs Peak Inn, Colorado, at *Bistorta bistortoides*, June 26 (*W. P. Cockerell*).

*Megachile chilopsidis*, Cockerell.

♀.—Cotulla, Texas, May 5 (*Crawford*).

*Megachile newelli*, Cockerell.

♀.—A characteristic feature is that the apex of clypeus is covered with pale hair.

Paris, Tex. (*Bishopp*); Victoria, Tex., at *Rudbeckia amplexicaulis*, April 28 (*Cushman*); Lafayette, La., at thistle, April 29 (*Cushman*); Mansfield, La., at *Helenium tenuifolium*, July 4 (*Bishopp*); Mound, La., at *Helenium tenuifolium*, Aug. 20 (*Bishopp*).

This is probably the female of *M. integra*, Cresson.

*Megachile henrici*, Cockerell.

♀.—Fernshaw, Australia (Nat. Mus. Vict. 18).

*Megachile derelicta*, Cockerell.

♀.—Brisbane, smaller than type, Sept. 24 (*Hacker*; Queensl. Mus. 75).

*Megachile quinquelineata*, Cockerell.

♀.—Kelvin Grove, Brisbane, Nov. 20 (*Hacker* ; Queensl. Mus. 67).

*Megachile cygnorum*, Cockerell.

♂.—“Woodend, Victoria” (*French* ; Froggatt, 169).  
N. S. Wales (Nat. Mus. Vict. 42).

*Megachile serricauda*, Cockerell.

♂.—Museum Gardens, Brisbane (Queensl. Mus. 69).

*Megachile mackayensis*, Cockerell.

♀.—New South Wales (Nat. Mus. Vict. 26).

*Megachile pictiventris*, Smith.

♀.—Clarence River, N. S. Wales (*Wilcox* ; Nat. Mus. Vict. 49, 50).

*Megachile semiluctuosa*, Smith.

♀.—Near Murray River (Nat. Mus. Vict. 13).

*Lithurgus gibbosus*, Smith.

The following localities are in Texas :—Fredericksburg, May 29 (*Mitchell*) ; Maverick Co., May 15 (*Mitchell*) ; Kerrville, May 31, ♂ ♀, at *Monarda citriodora* (*Pratt*) ; Cotulla, at *Opuntia*, ♂ ♀, May 5 (*Crawford, Pierce*).

*Lithurgus apicalis opuntiae*, Cockerell.

Cotulla, Tex., at *Opuntia*, ♀, May 5, 11 (*Crawford*) ; Nueces River, Zavalla Co., at *Opuntia*, April 30, ♂ (*Pratt*) ; Tucson, Arizona, at *Opuntia*, May 20–24, ♂ (*Pratt*).

*Anthidium tenuifloræ*, Cockerell.

♂.—Ward, Colorado, at *Grindelia subalpina*, Aug. 26 (*Cockerell*).

XLIX.—*On Mammals from Manus Island Admiralty Group, and Ruk Island, Bismarck Archipelago.* By OLDFIELD THOMAS.

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By the kindness of the Hon. Walter Rothschild the British Museum has had the opportunity of acquiring two collections of mammals, mostly bats, which had been obtained on the islands mentioned in the title by Mr. A. S. Meek and his brother-in-law Mr. Eichhorn.

With the exception of the few specimens collected by the 'Challenger' Expedition in 1875 (including the original series of *Pteropus admiralitatum*) the British Museum possessed no mammals at all from the Admiralty Islands, and from the Bismarck Archipelago only those got by the Rev. G. Brown on "Duke of York Island and the neighbouring shores of New Britain and New Ireland," and therefore little adapted for exact work on the insular distribution of the species. The two present collections are therefore extremely acceptable.

Curiously enough, there proves to be practically no difference between the corresponding species of the two collections; so that it would appear that there is one common fauna through the whole crescent of islands, from the Admiralties, through the main islands of the Bismarck Archipelago, to its extreme southern member Ruk Island.

Most of the species occurring in the two collections are already known from the larger Bismarck Islands, but in the case of *Dobsonia anderseni* it is possible that the similar-sized *D. prædatrix* may prove to represent it in the intermediate islands, even though it does belong to a different group of the genus.

The whole series consists of 43 specimens, belonging to 16 species, of which 4 have proved to need description as new. Some other new Australasian species which have now become evident are described in the succeeding paper.

1. *Pteropus neohibernicus*, Pet.

Two from Manus and one from Ruk.

2. *Pteropus capistratus*, Pet.

Two from Ruk.

These additional specimens of this rare and beautiful fruit-bat are very welcome.

3. *Dobsonia anderseni*, sp. n.

Three from Manus and three from Ruk.

A member of the *D. moluccensis* group. Size intermediate between that of the two large and the two smaller members of the group. Colour of head and mantle unusually dark.

The following account is arranged as in Dr. Andersen's Catalogue:—

*Diagnosis.* Allied to *D. moluccensis*, but smaller. Fore-arm in adults 123–125 mm. *Hab.* Admiralty and Ruk Islands.

*Dentition* as in *D. moluccensis*, the ridges and cusps quite as in that species.

*Colour.* Very dark. Head blackish brown, almost black; mantle dark brown, allied to but much darker than Ridgway's "mummy-brown"; conspicuously darker than in any of the four known species of the *moluccensis* group. Under surface sepia, the centre of the abdomen with an inconspicuous wash of dull ochraceous.

*Dentition* as in *D. moluccensis*, the ridges and cusps of the teeth quite as in that species.

*Measurements*:—

Forearm of type 124 mm., other specimens 123, 125 mm.

Third finger, metacarpal 79, first phalanx 56; lower leg and foot (c. u.) 89.

Skull: greatest length 54.5; palation to incisive foramina 25.2; zygomatic breadth 33.6; interorbital breadth 9; intertemporal breadth 8; front of canine to back of  $m^2$  20;  $m^1$  5.7 × 3;  $m_1$  4.5 × 2.2.

*Range.* Admiralty Islands and Ruk Island, southern Bismarck Archipelago. This would seem to involve occurrence in the other islands of the Bismarck Archipelago; but as these are occupied by *D. prædatrix*, a species of about the same size, but of quite another group, it is possible that the range of *D. anderseni* is really interrupted, and only covers the two islands first mentioned.

*Type.* Adult male. B.M. no. 14. 4. 1. 4. Collected 7th October, 1913.

This species is in size intermediate between *D. exoleta* and *moluccensis*, and fills up the gap between "a. Much smaller" and "b. Much larger" in Dr. Andersen's synopsis of the species (Cat. p. 459). It is also readily distinguishable from any of the other species of the section by its very much darker colour.

I have named the species in honour of Dr. K. Andersen, in recognition of the striking monograph of *Dobsonia* contained

in his Catalogue, a monograph which has entirely revolutionized our knowledge of the group. The fact also that the genus is named after Dr. G. E. Dobson creates a suitable juxtaposition of two names that must always be historical in connection with the classification of the Chiroptera.

#### 4. *Nyctimene vizzaccia*, sp. n.

Ruk Island. One specimen. Female. Collected 31st July, 1913. B.M. no. 14. 4. 1. 31. *Type*.

Allied to *N. varius*, K. And., with which it shares the varied Vizcacha- or *Lagidium*-like fur, strongly spotted condition of wings, and coalescence of the inner with the main cusp of  $p^3$ , but distinguished by the further coalescence of the corresponding cusps in the lower jaw and by its greater size.

Size medium, just on the upper limit of Dr. Anderson's "small" species. Fur long, hairs of back nearly 10 mm. in length. General colour above irregularly varied drab-grey, singularly like that of *Lagidium*, and in this way corresponding with that of *N. varius* and differing from that of the more uniformly coloured *N. papuanus*. Dorsal streak beginning at withers, rather well marked considering the waviness of the hair, but not nearly so much so as in *N. papuanus*. Under surface drabby grey laterally, pale buffy mesially, paler than in *varius*. Ears, arms, and digits profusely spotted with yellow, more so than in the allied species; wing-membranes also much mottled with yellow.

Skull much larger and heavier than that of *N. varius*, slightly exceeding in size the largest skulls of *N. papuanus*.

Teeth agreeing with those of *N. varius* and *minutus* in the fusion of the inner with the outer cusp of  $p^3$ , but differing by the further fusion of the corresponding cusp of  $p_3$ .

Dimensions of the type :—

Forearm 60 mm.

Third finger, metacarpus 44, first phalanx 32; lower leg and hind foot (c. u.) 37.

Skull: greatest length 29·8; zygomatic breadth 19·7; interorbital breadth 6·3; palatal length 14·7; maxillary tooth-row 10.

Type as above.

This species curiously bears out Dr. Andersen's arrangement of the genus by the correlation of its wavy fur with the structure of  $p^3$ , just as in his group " $b^2$ ," consisting of *N. minutus* and *varius*. Then, being even more mottled and spotted, it equally goes further in dentition, by its  $p_3$  also



taking on the same character as the corresponding upper tooth.

5. *Macroglossus lagochilus nanus*, Matsch.

One from Manus and one from Ruk.

The Admiralty specimen has seven cheek-teeth on each side below and six on one side above. It therefore attains, though with a different formula, the highest number of teeth mentioned in Dr. Andersen's list of abnormalities (Cat. pp. 754-5).

6. *Hipposideros demissus mirandus*, subsp. n.

Two specimens. Manus Island.

Like *H. demissus* of the Eastern Solomons, but without the definite lighter markings on the shoulders and underside characteristic of that form.

Nose-leaf apparently as in *demissus*, the median projection of the sella, however, unusually well developed. Lateral supplementary leaves short, the third one reduced to a few millimetres in length.

Colour uniformly pale brown; the tips of the dorsal hairs dark brown, their basal three-fourths pale buffy brown; shoulder- and lateral stripes little marked. Under surface little lighter than upper, uniformly pale brown, quite without the marked whitening in the pectoral region characteristic of *demissus*.

Dimensions of the type:—

Forearm 68·5 mm. (other specimen 72).

Third finger, metacarpus 50, first phalanx 23; lower leg and hind foot (c. u.) 42·8.

Skull: greatest length to front of canines 28; median upper length 23·5; zygomatic breadth 15·6; facial breadth 8·3; intertemporal breadth 3·1; maxillary tooth-row 11.

*Type.* Adult female. B.M. no. 14. 4. 1. 8. Original number 20. Collected 20th September, 1913.

7. *Pipistrellus angulatus*, Pet.

One. Manus Island, Admiralty Island.

8. *Murina* sp.

One. Ruk Island.

Allied to *M. lanosa* of Ceram.

9. *Miniopterus* sp. (large).

Manus Island (four).

10. *Miniopterus* sp. (small).

Manus Island (one).

I am not at present in a position to determine these specimens with any hope of accuracy.

11. *Kerivoula myrella*, sp. n.

One from Admiralty Island and three from Ruk Island.

General external characters as in *K. hardwickei*, to which a specimen from Duke of York Island (New Lauenburg) was referred by Dobson in 1878. Size rather greater. Upper-side of feet, tibiæ, and femora distinctly more heavily haired, the interfemoral also rather more hairy and with some hairs along its posterior margin.

Skull with the brain-case more inflated anteriorly, as in *Phoniscus*, but the muzzle of the specialized bent-up form characteristic of *Kerivoula*, that of *Phoniscus* being more normal. Front of muzzle, however, broadened to carry the much enlarged canines, the narrowest breadth of the rostrum being across the middle premolars instead of the anterior ones.

*Teeth*.—Inner upper incisors slender, unicuspid, outer ones about half their height. Canines very large and thick, of about normal section, though a young specimen shows something of the peculiar shape found in *Phoniscus*; projecting laterally outwards so as to be conspicuously visible from above and to have a markedly greater lateral expansion than the premolars next behind them, these again exceeding the median pair, the narrowest part across the maxillary tooth-row being outside the latter teeth. In *K. hardwickei* the tooth-row narrows forwards, and the narrowest part is across the anterior premolars. Premolars of normal shape, broader transversely than antero-posteriorly. In *K. agnella* the canines are somewhat, though not so much, enlarged, but the premolars are much narrower transversely. Lower premolars rather bulkier than in *hardwickei*.

Dimensions of the type ;—

Forearm 37·5 mm. (other specimens 38, 38·5).

Third finger, metacarpus 40, first phalanx 17·2; lower leg and hind foot (c. u.) 26.

Skull: greatest length 14·6; median upper length 12·3;

breadth of brain-case 7·7; palato-sinual length 6·6; maxillary tooth-row 6·1; outer breadth across canines 3·9.

*Hab.* Admiralty Islands and Bismarck Archipelago. Type from Manus Island.

*Type.* Adult (probably male). B.M. no. 14. 4. 1. 10. Original number 13. Collected 8th September, 1913.

This species is readily distinguishable by the enlargement of its canines, a development which reaches its extreme in the great sabre-like canines of *Phoniscus*. Indeed, I do not feel sure how far the status of *Phoniscus* as a distinct genus will be affected by the condition found in *K. myrella* and *agnella*, in each of which something of its character is shown.

I may note here that on Mr. Miller's suggestion I have examined the types of *Kerivoula papuensis*, Dobs., and *K. javana*, Thos., and find them both to be clearly referable to *Phoniscus*.

12. *Emballonura solomonis*, Thos.

Three from Manus and three from Ruk Island.

As happens so frequently, the Bismarck Archipelago form is quite like that of the Solomons, while the New Guinea one is distinct. The latter is described in the next paper.

13. *Epinys browni*, Alst.

Three. Manus Island.

14. *Phalanger maculatus krämeri*, Schwarz.

Two specimens (and two in Tring Museum). Manus Island.

15. *Phalanger orientalis*, Pall.

♂. Ruk Island.

16. *Echymipera cockerelli*, Rams.

♂. Admiralty Island.

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L.—*New Asiatic and Australasian Bats and a new Bandicoot.* By OLDFIELD THOMAS.

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*Eptesicus pumilus caurinus*, subsp. n.

General characters as in *pumilus*, but size smaller, the forearm about the minimum for the species, and the skull conspicuously smaller.

Colour dark, the tips of the hairs drabby grey; under surface not lighter than upper. The specimens, however, have been put in fluid and then dried, so that the colour may have been affected.

Skull very small and delicate, less flattened than in true *pumilus*, the brain-case high, rounded, well inflated in the frontal region, narrower than in *pumilus*. Teeth as in *pumilus*, but slightly smaller throughout.

Dimensions of the type:—

Forearm 30 mm.

Skull: greatest length 11·2; basi-sinual length 8·5; mastoid breadth 6·5; maxillary tooth-row 4·0.

*Hab.* Drysdale, Kimberley, N. Australia.

*Type.* Adult male. B.M. no. 14. 3. 9. 1. Collected by G. F. Hill, and presented by the West Australian Museum, Perth. Four specimens examined.

This little bat has so much smaller a skull than ordinary *E. pumilus* that it would seem at first sight to be a different species, but intermediate specimens seem to occur, as notably one from Port Walcott, N.W. Australia, so that I think it better to describe it as a subspecies of the common form. I owe the opportunity of examining the typical series to Mr. B. H. Woodward, of the Perth Museum, where two of the paratypes will be preserved.

*Eptesicus pumilus vulturnus*, subsp. n.

Size and general characters as in true *pumilus*, but colour much darker.

Colour above dark auburn-brown, the bases of the hairs blackish brown. Below, the surface-colour is but little lighter, though of a rather more drabby tone.

Skull low, flattened, its size about as in true *pumilus*.

Dimensions of the type (measured on the skin):—

Forearm 33 mm.

Skull: greatest length 12·5; basi-sinual length 9·6; mastoid breadth 7·3; maxillary tooth-row 4·5.

*Hab.* Tasmania.

*Type.* Adult female. B.M. no. 7. 1. 1. 375. 29 D of Tomes Collection. Obtained by Mr. Tomes from J. P. Verreaux. Other specimens collected and presented by Mr. Ronald Gunn.

A dark "saturate" race of *E. pumilus*.

*Murina huttoni rubella*, subsp. n.

Essential characters of the N.-Indian *huttoni*, but the

colour dark rufous brown (rather warmer than "sayal-brown" of Ridgway). Underfur tipped with rufous brown, longer hairs glossy golden brown. Under surface rather paler than upper on sides, and still paler down the median area, but without strong contrasts. Interfemoral rather more hairy than in *huttoni*.

Dimensions of the type:—

Forearm 37.5 mm.

Skull: greatest length 18.2; basi-sinual length 13.7; front of canine to back of  $m^3$  6.2.

*Hab.* Kuatun, Fokien, China.

*Type:* Adult male. B.M. no. 8. 8. 11. 6. Collected 21st Sept., 1896, and presented by F. W. Styan. Seven specimens, all from Kuatun, presented by J. D. la Touche and F. W. Styan.

A fresh skin of true *M. huttoni*, recently obtained by the Bombay Survey from Kumaon, is very much greyer than the uniformly rufous series from Kuatun. And the same is the case with a skin from Darjiling presented by B. H. Hodgson.

Dobson assigned *M. huttoni* to Milne-Edwards's *M. leucogaster*, but that animal is very considerably larger, its forearm 41 mm., and its skull (as figured) 20 mm.

### *Kerivoula flora*, sp. n.

General characters of *K. hardwickei*, but larger and more robust throughout. Colour, distribution of fur, and structure of ears and tragus as in that species, so far as can be made out on a spirit-specimen.

Skull essentially as in *hardwickei*, but decidedly larger. Brain-case rather more inflated anteriorly than posteriorly. Muzzle as in typical *Kerivoula*, not as in *Phoniscus*.

Teeth similar in proportions to those of *K. hardwickei*, the canines not enlarged as in *K. myrella*, but, if anything, rather smaller in proportion than in *K. hardwickei*. Premolars as in the latter species.

Dimensions of the type (measured on the spirit-specimen):—

Forearm 39.5 mm.

Head and body 43; tail 49; ear 13; tragus on inner edge 8; third finger, metacarpus 40, first phalanx 19; lower leg and hind foot (c. u.) 26.

Skull: greatest length 16; median upper length 13.4; zygomatic breadth 10; intertemporal breadth 3.5; breadth of brain-case 8; palato-sinual length 7; maxillary tooth-row 6.2; breadth across canines 3.8.

*Hab.* S. Flores.

*Type.* Adult female. B.M. no. 97.4.18.22. Collected by A. H. Everett.

This species is a large ally of *K. hardwickei*, and has nothing of the peculiar increase in size of the canines characteristic of *K. myrella*.

*Emballonura stresemanni*, sp. n.

Most nearly allied to *E. raffrayana*, Dobs., but the skull larger and the ears thinner, narrower, and more pointed.

General characters as in *raffrayana*, the tragus similarly truncated and nearly parallel-sided. Nostrils circular, far apart, the notch between them unusually deep, so that they are more distinctly tubular than in other species. Ears slender, narrow, the inner margin very slightly convex, the tip narrowly rounded, the outer margin straight or faintly concave above, then convex, with a well-defined basal lobe, separated by a distinct notch.

Skull very similar to that of *E. raffrayana*, but larger throughout. Muzzle broad, not specially inflated laterally; frontal region with a broad median groove running back to the level of the intertemporal constriction. Basisphenoid concavity divided into two by a single median ridge, but not into four by the presence of two supplementary lateral ridges, as is the case in the single skull of *E. raffrayana*.

Dimensions of the type (measured on the spirit-specimen) :—

Forearm 41 mm.

Head and body 46; tail 6; ear 13.5; tragus on inner edge 3.6; third finger, metacarpus 36.5, first phalanx 10; lower leg and hind foot (c. u.) 24.5.

Skull: greatest length 16; basi-sinual length 12.2; anterior breadth 7.6; breadth of brain-case 7.2; front of canine to back of  $m^3$  5.3.

*Hab.* Mt. Lumutu, Western Ceram.

*Type.* Adult female. B.M. no. 13.3.6.29. Collected and presented by Herr E. Stresemann. Five specimens, all females.

This species is distinguished from *E. raffrayana*, to which alone it is related, by its comparatively long and narrow ears and its larger skull.

I may note, on the authority of Prof. Trouessart, that the locality given by Dobson for *E. raffrayana*, Gilolo, is an error, and that its true locality is Mefor Island, Geelvink Bay, Western New Guinea. One of the typical specimens is in the British Museum.

*Emballonura nigrescens and its Allies.*

A study of these and the material in the Museum shows that three species of the *nigrescens* group may be distinguished, as follows :—

- A. Size larger: forearm about 35–38 mm. Skull longer (upper length about 12 mm.), low, the brain-case not specially inflated and the muzzle fairly long; no mesial septum in the basisphenoid pit. (Solomon Island, Bismarck Archipelago, Admiralty Islands.) ..... *E. solomonis*, Thos.
- B. Size rather smaller: forearm about 34 mm. Skull rather smaller (upper length 11 mm.), shaped about as in *solomonis*. A well-defined mesial ridge in the basisphenoid pit. (Amboina and Buru.) ..... *E. nigrescens*, Gray.
- C. Size as in *nigrescens* (forearm about 33–34 mm.). Skull of about the same length (upper length 11 mm.), but differently proportioned, the brain-case large, high, and much inflated, the muzzle short and stumpy. No basisphenoid septum. (New Guinea.) ..... *E. papuana*, sp. n.

Details of *E. papuana* :—

Dimensions of type (italicized measurements taken in flesh) :—

*Head and body* 38 mm.; *tail* 11; *ear* 10. Third finger, metacarpus 30, first phalanx 8·8; lower leg and foot 16.

Skull: upper length 10·9; basi-sinual length 8·2; zygomatic breadth 8; interorbital breadth 3·2; brain-case, height 6, breadth 6·2; front of canine to back of  $m^3$  4·3.

*Hab.* (of type). Wakatimi, Mimika River, S.W. Dutch New Guinea.

*Type.* Adult male. B.M. no. 11. 11. 11. 13. Original number 2571. Collected 7th March, 1911. Presented by the B.O.U. Expedition to New Guinea.

More than a dozen specimens of this species are in the Museum collection, its range extending from the type-locality to the eastern end of the island.

*Echymipera gargantua*, sp. n.

Similar to *E. doreyana* in general characters, but size much larger—the skull 82–88 mm. in condylo-basal length, instead of about 70–73 mm.

Dimensions of the type (measured in flesh) :—

Head and body 410 mm.; hind foot 74; ear 31.

Skull: condylo-basal length 83; zygomatic breadth 30·5; length of nasals 36·5; intertemporal breadth 14·8; height from condyle to occipital protuberances 23; palatal length 51·5; combined length of three anterior molariform teeth 12·8.

*Range.* New Guinea and D'Entrecasteaux Islands. Type from Mimika River, S.W. Dutch New Guinea.

*Type.* Young adult male. B.M. no. 11. 11. 11. 97. Original number 3045. Collected 30th August, 1910, by G. C. Shortridge. Presented by the B.O.U. Expedition to New Guinea.

After renewed consideration I have come to the conclusion that it is impossible to consider the very large *Echymipera*, of which skull-measurements have been occasionally published \*, as the same species as *E. doreyana*. I have before me three of the large form and twelve of the smaller, and among these latter there are individuals of both sexes and all ages; and the only explanation seems to be that there are really two species occurring in the same area, and as distinct from each other by size as are the stoat and the weasel.

The gap in size of skull between the two is very marked, both in actual length (73 mm. in the largest *doreyana*, 83 in the smallest *gargantua*) and in general bulk.

With regard to nomenclature, all the names seem to have been applied to the smaller of the two forms. Dr. Jentink, as I did formerly, considered them all one; but his measures show the same gap as ours do. Whether any of the large form were before Dr. Cohn when writing his somewhat eccentrically prepared paper on the group † is not clear, as he only gives proportional (and not absolute) measures; but, in any case, if they were, he took them for the typical *doreyana*, giving the duplicate names *alticeps* and *breviceps* to the smaller form, and *keiensis* to the Key Island one, which already had a special name (*rufescens*).

It may be noted that the type of *doreyana* was an old male with much worn teeth, and that its skull-length is conspicuously less than is that of the type of *gargantua*, which is a youngish adult, its teeth almost unworn. The largest *gargantua* attains a condylo-basal length of 88 mm.

\* *E. g.*, Thos. Cat. Mars. B. M. p. 249, the male specimen, and Jentink, Nova Guinea, ix. p. 179. Male no. 306 and male without number.

† Zool. Anz. 1910, p. 718.



II.—*New Mollusca of the Genera Pleurotoma (Surcula), Oliva, and Limopsis from Japan.* By G. B. SOWERBY, F.L.S.

[Plate XVIII.]

*Pleurotoma (Surcula) mirabilis.* (Pl. XVIII. fig. 1.)

Testa elongato-fusiformis, albida, flammis fuscis obliquis latiusculis ornata, spiraliter liris numerosis angustis munita, longitudinaliter oblique subtilissime striata; anfractus 12, superne leviter concavi, deinde convexiusculi; anfractus ultimus  $\frac{2}{3}$  longitudinis testæ vix æquans, supra convexiusculus, deinde convexus, infra elongatim productus; apertura oblongo-ovata, peristoma acutum, arcuatum, postice late sinuatum; canalis elongatus, latiusculus; columella lævis, rectiuscula.

Long. 95, maj. diam. 24 mm.

*Hab.* Nagasaki, Japan.

The broad brown longitudinal flames give this shell a handsome appearance. Its nearest ally is *P. australis*, from which it differs not only in ornamentation, the whorls being less swollen, the body whorl longer, and the sculpture finer.

*Oliva concavospira.* (Pl. XVIII. fig. 2.)

Testa oblongo-cylindracea, crassa, straminea, lineis angulatim undulatis longitudinaliter ornata; spira concavo-depressa, callosa; sutura anguste canaliculata; apertura mediocriter lata, intus pallide cærulescens; peristoma crassiusculum, postice acute elevatum; columella ubique crassi-plicata, callo postico elevato.

Long. 35, maj. diam. 19 mm.

*Hab.* Loo Choo.

This species exhibits a very unusual character, the spire being sunk in a concavity below the shoulder of the body-whorl.

*Limopsis tajimæ.* (Pl. XVIII. fig. 3.)

Testa oblique ovalis, depressa, concentrice lirata, obscurissime radiatim striata; periostracum tenue, fuscum, radiatim tenuiter pilosum; umbones paulo elevati. Pagina interna lævis, alba; fossula ligamentali latiuscula; cardo mediocriter lato, dentibus circiter 15 irregularibus.

Diam. antero-post. 28, umbono-marg. 23 mm.

*Hab.* Tajima, Sea of Japan.

This shell somewhat resembles *L. zonalis*, Dall; the radiating rows of hairs in the periostracum are much closer and thinner.

## PROCEEDINGS OF LEARNED SOCIETIES.

## GEOLOGICAL SOCIETY.

December 3rd, 1913.—Dr. Aubrey Strahan, F.R.S., President,  
in the Chair.

The following communications were read:—

1. 'A Contribution to our Knowledge of the Geology of the Kent Coalfield.' By Dr. E. A. Newell Arber, M.A., F.L.S., F.G.S.

In this paper an attempt is made to give a general and connected account of the Carboniferous rocks of Kent, based on the evidence of some nineteen borings or sinkings. The Mesozoic cover of this wholly concealed coalfield is ignored. It is shown that the proved area is 200 square miles (128,000 acres), partly lying beneath land, and partly beneath the North Sea, the Straits of Dover, and the English Channel. The general strike is about 30° south of east and north of west, and the dip of the Transition Coal Measures is 2° to 3°, in the two localities where reliable evidence is alone available on this point.

The area, as a whole, is a syncline, limited on the north and south by Armorican folds, of which the northern has been now fairly accurately located. There is evidence also of a fold on the east; and it is maintained that the Kent coalfield is not continuous with that of the Pas de Calais. There are reasons for believing that the western boundary is a great fault.

The chief surface-feature of the Coal Measures is that of an inclined plane, sloping rapidly but regularly westwards and south-westwards from an elevated region near Ripple and Deal in the east.

The Lower Carboniferous rocks exceed 450 feet in thickness, and were denuded before the Coal Measures were deposited.

The Coal Measures consist of the Transition Series (1700 to 2000 feet thick), and the Middle Coal Measures (2000 feet). No Lower Coal Measures or Millstone Grit occur. The measures are grey throughout, and no red rocks, Espley rocks, *Spirorbis*-limestones, nor igneous rocks occur.

The coals are well distributed, and are often of considerable thickness, although there is a frequent tendency to splitting and inconstancy. Steam and household coals predominate, but gas-coals also occur.

The most productive portions of the measures are the higher part of the Transition and the lower part of the Middle Coal Measures.

2. 'On the Fossil Floras of the Kent Coalfield.' By Dr. E. A. Newell Arber, M.A., F.L.S., F.G.S.

The floras of ten further borings in Kent are here recorded, and the number of species known from the Kent Coalfield is raised to 96, as compared with 10 known in 1892 and 26 in 1909. A

number of the more interesting records are described and figured, some of them being new to Britain, or not previously found on the horizons in question.

As regards the horizons present in Kent, the plant-remains indicate that, in the area so far proved, only Middle or Transition Coal Measures, or both, occur.

December 17th, 1913.—Dr. Aubrey Strahan, F.R.S., President, in the Chair.

The following communication was read:—

‘Supplementary Note on the Discovery of a Palæolithic Human Skull and Mandible at Piltdown (Sussex).’ By Charles Dawson, F.S.A., F.G.S., and Arthur Smith Woodward, LL.D., F.R.S., Sec.G.S. With an Appendix by Prof. Grafton Elliot Smith, M.A., M.D., V.P.R.S.

The gravel at Piltdown (Sussex) below the surface-soil is divided into three distinct beds:—

The first, or uppermost, contains subangular flints and ‘eoliths,’ and one palæolith was discovered there *in situ*.

The second is a very dark bed, composed of ironstone and sub-angular flints. All the fossils so far found in the pit have been discovered in, or traced to, this bed, with the exception of the remains of deer. A cast of a Chalk fossil, *Echinocorys vulgaris*, from the Zone of *Micraster cor-testudinarium*, occurred as a pebble.

The third bed was recognized only this year, and consists of reconstructed material from the underlying Wealden rock (Hastings Series). It is only about 8 inches thick, and contains very big flints (8 to 15 inches long) which have been little rolled, and are not striated. They are saturated with iron, and have undergone considerable chemical change. They differ very markedly in appearance from the smaller flints in the upper strata. No implements, ‘eoliths,’ or fossil bones have been met with in this bed.

The floor of the gravel, where the remains of *Eoanthropus* were discovered, has been carefully exposed, and many irregularities and depressions have been found to exist. In some of these depressions small patches of the dark overlying bed remained, and new specimens were discovered. The method adopted in excavation is described.

The finds made this year are few but important, and include the nasal bones, and a canine tooth of *Eoanthropus* discovered by Father P. Teilhard de Chardin; also a fragment of a molar of *Stegodon* and another of *Rhinoceros*; an incisor and broken ramus of Beaver (*Castor fiber*); a worked flint from the dark bed; and a palæolithic implement from the debris in the pit. It will be noted that the remains are those of a land fauna only. The further occurrence of bedded flint-bearing gravels in the vicinity of the pit is noted.

The Authors’ former conclusions, as to the Pliocene forms having been derived, are maintained.

A further study of the cranium of *Eoanthropus* shows that the occipital and right parietal bones need slight readjustment in the reconstruction, but the result does not alter essentially any of the conclusions already published. The nasal bones, now described, are typically human, but relatively small and broad, resembling those of some of the existing Melanesian and African races. The right lower canine tooth may be regarded as belonging to the imperfect mandibular ramus already described. It is relatively large and stout, and, like the molar teeth, it has been much worn by mastication. The worn surface on the inner aspect extends down to the gum, and proves that the upper and lower canines completely interlocked, as in the apes. In shape, the canine resembles the milk-canine of man and that of the apes more closely than it agrees with the permanent canine of any known ape. In accordance with a well-known palaeontological law, it therefore approaches the canine of the hypothetical Tertiary Anthropoids more nearly than any corresponding tooth hitherto found.

The rolled fragment of an upper molar of *Rhinoceros* is highly mineralized, and has the appearance of a derived fossil. It is specifically indeterminable, but seems to agree best with the teeth of *Rh. etruscus* or *Rh. mercki* (= *leptorhinus* Owen).

#### MISCELLANEOUS.

*Distribution of Limnoria lignorum* (Rathke) and *Limnoria antarctica*, Pfeffer. By CHAS. CHILTON, M.A., D.Sc., LL.D., M.B., C.M., F.L.S., Professor of Biology, Canterbury College, N.Z.

SINCE the MS. of my paper on "The Species of *Limnoria*" was sent to the printer, I have received Dr. W. M. Tattersall's Report on 'The Schizopoda, Stomatopoda, and non-Antarctic Isopoda of the Scottish National Antarctic Expedition,' in which he states that one specimen of *Limnoria lignorum* was found among other Isopoda collected by the 'Scotia' at Port Stanley, Falkland Islands. He says, "I can find no appreciable differences from northern specimens of the same species" (Trans. Roy. Soc. Edinburgh, vol. xlix. p. 882, 1913).

Dr. Tattersall also draws attention to the fact that Mr. Stebbing has recorded this species from Port Elizabeth, South Africa ('South African Crustacea,' part iv. p. 50, 1908). Mr. Stebbing's specimens were found burrowing in wood, and he ascertained by dissection that they agreed with the description and figures of the European species given by Sars. I had overlooked Mr. Stebbing's record of the species in South Africa.

*Limnoria antarctica* has recently been recorded from Deception Island, in the South Shetland Islands, by Miss H. Richardson ('Deuxième Expédition Antarctique Française, Crustacés Isopodes,' p. 8), whose paper also reached me after my MS. had been sent to the printer.

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# THE ANNALS

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## MAGAZINE OF NATURAL HISTORY.

[EIGHTH SERIES.]

No. 77. MAY 1914.

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LII.—*A Review of South-African Land-Mollusca belonging to the Family Zonitidæ.*—Part III.\* By Lt.-Colonel H. H. GODWIN-AUSTEN, F.R.S. &c.

[Plates XIX. & XX.]

THE specimens of *Vitrina corneus* and *poeppigi* alluded to in *Annals & Mag. Nat. Hist.* ser. 8, vol. x. p. 264, August 1912, duly came to hand, after considerable delay, and have been compared with the material in this country. Both Mr. John Ponsonby and Major M. Connolly have been associated with me in the examination of species. With the latter officer I have very recently (13th December) compared these typical shells with the species of this South-African group in the Natural History Museum.

Those who may study these South-African genera will soon realize how very similar the shells of the species collected and described by the early collectors are in form, and how very little there is in shell-character to go upon. At that period a description would be framed on several examples, the type-shell was seldom singled out. The difficulty seemed to me to be greater when specimens, collected 50 to 60 years ago, were under comparison with those collected more recently in or about the same tract of country. Changed conditions must be taken into con-

\* Part I., with plates i.-vii., was published in the 'Annals' for January 1912, pp. 122-139; Part II., with plates xii.-xvii., appeared in the 'Annals' for May 1912, pp. 569-585.

sideration and it has occurred to me as possible that shells of a species hatched in a very wet hot season, when food is abundant, will present a generally more tumid shape than those of the same species produced during a year of drought. The collector soon notices that species of many genera vary locally, even at distances of only 100 miles, even less, geological formation having much to say to the change, or the more or less wooded character of the country.

Taking any large place, say Maritzburg in Natal, it would be most difficult to define what was the extent of bush or jungle when the earlier European settlers came there. Still more difficult in its immediate neighbourhood to strike the spot where the earliest conchologists obtained their typical shells. Stations in India tell this story in an equally strong way, and I am led to give an example or two. The virgin forest in which Darjiling was once buried is gone. Slopes of the hills facing Peshawur, which, in 1854, when I was there, had a fair amount of scrubby growth in the valleys, must now be bare. Wood brought in by men and on donkeys was coming into the cantonment day by day, for the consumption of a large garrison; this has gone on ever since—one can imagine what a change in the fauna and flora must have been produced in the interval of sixty years, in a flora not to be compared with the richness of that of Darjiling. Where a clean sweep has been made of the mountain slopes, invertebrates have not a chance of survival over thousands of acres.

Unfortunately no description has been made from life of any of the animals of the species placed in my hands, some are so white and unspotted they give one the idea of being bleached in the preserving liquid. In others, again, every speck is preserved. The distribution of the black-and-white spots, blotches, and bands is very constant in all the batches I have had to examine, and may be considered a reliable character, although, possibly, a local one. It would be more conspicuous in life or shortly after preservation.

In the following species the examples were all alike:—*Peltatus trotteriana*, 5 examples; *Kerkophorus phædinus*, 5; *melvilli*, 5; *poepigii*, 5; *vitalis*, 6; *leucospira*, 10; *bicolor*, 3; *tongauiensis*, 12; one example white throughout, no mottling, another similarly white, with slight mottling.

Where several species are met with in the same locality, we may expect to find a certain number of hybrid forms.

Before giving the results of this examination, I must offer my sincere thanks to Dr. Dohrn for so kindly entrusting these

type-specimens to me—they have proved invaluable, and set at rest what was previously very doubtful determination\*.

I shall first refer to four specimens in Tube no. 42, Stettin Museum, labelled *Vitrina cornea*, Pfr.; it was agreed by us that they represented two different species, these I designate:—

A. Two banded shells, quite smooth.

B. Two unbanded, with higher spire and globose.

A. One of these compares so well with the shell figured by Küster as *V. cornea*, Pfr., pl. ii. figs. 31–33, p. 21 (1854), in all respects, there appears to be every probability it is the very shell from which the figures were made. A also agrees with *V. cornea*, Mke., in British Museum Collection from Cape Natal (Mus. Cuming), 3 examples; also with a single specimen from same collection (M. C.) and with three others from Natal, No. 57, 1. 16. 14.

B. Finest specimen, agrees best with *K. natalensis*, in the British Museum Collection (M. C.).

The second tube from the Stettin Museum contained also two species; it had no number, but is labelled *poeppigi*, Mke., Natal, a species figured by Küster, pl. ii. figs. 13–15. Very small with a distinct band:—

a. One very small, banded (shell damaged).

b. A large unbanded shell, quite 16 mm. in major diameter and of a different shape, with high spire, figured. This I consider the same species as B above, viz., *natalensis*, Krs., it has microscopic longitudinal striation.

*Kerkophorus corneus*, *natalensis*, and *poeppigi* are recorded from the same locality, Port Natal, and are coast species. Mr. Burnup, in a letter of 25th August, 1911, says there is considerable variation between such and those Maritzburg species, 50 miles inland and 2000 feet above the sea; we must therefore take this into consideration when comparing these species, and we must not go to Maritzburg in search of *K. corneus*—there we find a shell which is well known as *K. phedimus*. We still want more material to see how far the animals of the two places differ.

Port Shepstone is 75 miles south along the coast from Port Natal or Durban, and we may assume that species of

\* It is with deep regret I have to record the death of Dr. Dohrn. I wrote to him in January, and soon heard the sad news, but no details. I have only very recently heard from the Trustees of the Stettin Museum that he died at Florence on the 1st October, 1913, when on his way to Naples. He had been much overworked in 1912–13, first packing away and moving collections, and then getting them rearranged in the new buildings. As the letter says, his loss is irreparable.

*Kerkophorus* are common to both places, or the most likely to be so; the same applies to Equeefa, from which Mr. Burnup has sent specimens and which is near the coast, between the two.

In Part II., 1912, p. 573, I mentioned species of *phædimus*, received from Mr. Burnup. I have examined them again; they are thus distinguished:—

A. From Maritzburg, small narrowly banded shells, four in number, depressed in form, 12 to 13 mm. major diameter.

B. ? *phædimus*, from Durban.

Larger shells. Three unbanded, one well-banded variety, no other difference noticeable between them. A and B I now consider distinct, although on page 573 I wrote: "they present no difference save in size." A comparison of the largest of the unbanded Durban shells, 12 mm. in major diameter, with a typical shell of *K. natalensis*, 13 mm. in major diameter, in the British Museum Collection, has led me to think differently. B, no doubt, is *K. corneus*, compared with the Stettin Museum shell.

It is necessary to state the evidence we now have as to the species *K. natalensis*, Krs. The type or, to say more accurately, typical shells were received by Mr. E. A. Smith of the British Museum from Dr. Lampart of the Stuttgart Museum, and compared with the examples bearing this name in the Natural History Museum, and were found to agree. These include:—

Four examples, *ex* Cuming Collection.

Three examples, *ex* Cuming Collection, marked: "This agrees with type drawn," 8. v. 11.—*H. H. G.-A.*

Three examples.

Many fully grown, all unbanded, globose, large, smooth and shining, ochraceous green.

Two examples. Very large, banded, Port Natal, 40 miles south of Durban, seem to be the same as the unbanded.

Through the courtesy of the Trustees of the Stettin Museum, I have received for comparison a fine typical specimen of *K. natalensis*, which agrees in every way with those I mention above. It has the decided greenish tinge, no bands, and is 17 mm. in major diameter.

Port Shepstone, Burnup says, is a locality especially prolific in strange forms of this group. He sent me some eight packets, representing twenty-seven specimens; and had these been preserved in spirit and the animals left in their shells they would have formed a most valuable collection. It is to be hoped this excellent collector and observer will, at some

time or other, be able to collect a similar number in this way in many localities.

An organ of great interest is the spermatophore; it is very distinctive in the *Peltatinæ*. If we knew what amount of variation there may be in well-known species of the three genera—whether in a batch of the same species, taken at the same time and in the same place, the spermatophores proved constant in form—we should have a very valuable character, both generic and specific. The labour of examination would no doubt be great, both in finding and drawing the organ; yet it would be worth doing, and in these pages will be found something to start on.

The following alterations have to be made in the Explanation of Plates, already published in Part I. ('Annals' for January 1912) and Part II. ('Annals' for May 1912):—

#### Part I.

Plate i. figs. 1-1 *b*. *Kerkophorus corneus*? Maritzburg:  
is *bicolor*, sp. n.

Plate ii. figs. 2-2 *b* (No. 15) *K.*, sp. n.? Maritzburg:  
is *K. burnupi*, sp. n.

Plate ii. figs. 3-3 *a* (No. 3379), *K.*, sp. n.?, undetermined. Pinetown:  
is *K. poeppigi*, Mke. (animal).

#### Part II.

Plate xii. figs. 1-1 *b*. *K. poeppigi*, Mke.? Pine Town, near Durban  
(No. 3379):

is *poeppigi*.

Plate xv. figs. 1-1 *d*. *K. ampliata*, M. & P. (No. 7):  
is *K. ? natalensis*, Krs. Maritzburg.

I give the original descriptions of the first species obtained by Menke and Krauss. It is unfortunate that from their habitat, Durban, I have only been able to examine the animal of one, determined as *poeppigi*, from Pinetown, near to Durban. It would be most interesting to get a good full-grown animal of *K. natalensis*, for I have only had for examination a young specimen from Equeefa, agreeing best with the typical form.

#### *Vitrina poeppigii*, Menke.

Symbolæ, iii. 1846, p. 81.

"*T. imperforata*, globulosa, tenuissima, striatula, nitida, pellucida, lutescenti-cornea, linea 1 rufa supra peripheriam cincta; spira brevissima, obtusa; sutura submarginata; anfr. 4, convexiusculi, ultimus inflatus; apertura rotundato-lunaris, margine dextro subrepando, columellari leviter arcuato, subverticaliter descendente.

"Diam. maj.  $10\frac{1}{2}$ , min. 9, alt. 7 mm."

Port Natal.

Specimen in B.M. is banded and looks immature. Great similarity to *cornea*, of which there are four specimens from M. C. and one from some other source.

*Vitrina cornea*, Pfr.

Symbolæ ad Historiam Heliceorum, iii. 1846, p. 81, Dr. Lud. Pfeiffer.

Original description :—

- “*T. imperforata*, globoso depressa, tenuissima, striatula, pallide cornea; spira brevis, obtusa; anfr. 4 vix convexi, ultimis multo latior, subdepressus; apertura deobliqua, ampla, lunaris; perist. simplex, rectum, margine dextro antrorsum arcuato, columellari declivi, leviter arcuato, superne brevissime reflexo-appresso.  
“Diam. maj. 16, min. 13, alt. 9 mm.”

Port Natal (*Menke*).  $\beta$ . linea 1 pallide fusca periphæria.

*Kerkophorus natalensis*, Kr.

‘Die Südafrikanischen Mollusken,’ by Professor Dr. Ferd. Krauss (1848).

*Vitrina natalensis*, Krauss, Tab. iv. f. 17.

Original description (p. 74) :—

- “*V. testa* imperforata, globulosa, solidiuscula, subglabra, nitida, pellucida, corneo-fuscescente, *linea unica rufa supra peripheriam cincta*; spira brevi, obtusiuscula; anfractibus 5 convexiusculis, ultimo inflato; apertura perobliqua, ampla, rotundato-lunari; peristomate simplice, margine dextro arcuato, castaneo; columella obliqua, superne reflexo-appressa, alba.  
“Diam. major 8·4, min. 7, alt. 4·6 lin.”

Mon. Hel. Viv. vol. ii. p. 505. Habitat ad portum Natal.—Diam. major 19, min. 16, alt. 12 mm.

“In terra natalensi.”

In the Natural History Collection, there are three specimens which were purchased from Dr. Krauss, in neither is any rufous band to be seen—it may be a variable character. Next the protoconch the surface of the shell is finely decussate, which gradually disappears and only very fine spiral lines are then to be seen.

*Kerkophorus poeppigi*, Menke.

See Ann. & Mag. Nat. Hist. ser. 8, vol. ix. p. 583, pl. xii. (May 1912).

*Locality*. Pinetown, near Durban, Natal (3379, *Burnup*, No. 15, B.M.). Connolly, Annals S. A. Mus. 1912, p. 110.

Shell very minutely perforate, globosely conoid, shiny; sculpture quite smooth to the eye, highly magnified there is close, very fine, longitudinal striation; colour ochraceous, with an orange tinge, a fairly broad band just above the periphery; spire rather depressedly conic, apex blunt; suture impressed; whorls 4, at first regularly increasing, the last more rapidly; aperture broadly lunate, oblique; peristome thin; columellar margin very feeble, and with a mere indication of reflexion.

Size: major diameter 14.5, minor 13.0; alt. axis 8.0 mm.

*Animal*.—Lobe at extremity of the foot very long. Right and left shell-lobes very long and narrow, left dorsal lobe in two parts. *Visceral sac very dark umber-brown from the kidney to the apex. Kidney a rich brown colour.*

*Genitalia* (pl. xii. fig. 1).—In the species the epiphallus is extremely short, the cœcum is close to the retractor muscle, the flagellum long, the vas deferens junction at its base. In the figure the spermatheca is shown broken after the spermatophores had been taken out of it. There were two—the first instance of my finding more than one in this sub-family. One was remarkably perfect (pl. xii. fig. 1 a), the other, the oldest (pl. xii. fig. 1 b), had lost its spines, only their bases remained, the flume is whip-like at the end. The spines are straight and branched from just above the base, all bifid at the several terminations. There are seven on one side basal and fifteen on the other ( $\frac{7}{15}$ ), the fifteenth is more distant from its neighbours and represents the bifurcation at the points where the whip-like portion commences (*vide* pl. xii. fig. 1 b).

*Radula*.—The formula is 52.3.8.1.8.3.52, or 63.1.63. The central teeth are, as usual, rather small, the marginals are bicuspid, points nearly even, on the extreme margin and about seven or eight from the side—among the minute teeth, one here and there is tricuspid. Jaw with central projection.

### *Kerkophorus ? poeppigi*, Menke.

*Locality*. Thornybush (3411, Burnup, No. 16, B.M.).

*Animal*.—Extremity of foot with elongate lobe tipped dark, foot divided, right shell-lobe small and narrow, the left quite small. *Visceral sac, no markings on wall of branchial chamber, a faint band of black above the kidney, and same with faint pale mottling towards the apex which is darker.* Pale brown tint throughout.

Generative organs as in other allied species. A spermato-

phore was present in the spermatheca and is similar in form of its spines to No. 3379; it is not quite perfect. At the junction with capsule the flume has four spines on one side, followed by fourteen on the other, which is not the complete number—this portion and the flagellate end being broken off.

*Kerkophorus ? natalensis*, Kr.

Shell very globose, not fully grown. Very microscopic longitudinal striation.

*Locality.* Equeefa (3387, No. 12, *H.C. Burnup*, B.M., spirit-specimen no. 8).

Mr. Burnup says of this species: "These, of course, come very near to No. 13, but there being two specimens exactly agreeing with each other in form and colour, and slightly disagreeing in both these respects with No. 13. I have kept them separate until you decide if they all three belong to one species. It is only by such means that we shall be able to learn the limitations of each species."

No. 13 is dark grey on the foot, and is the same species evidently as No. 12, the spotting on the visceral sac is of the same character.

The animal is dark-coloured on the foot, also on head and neck, and the eye-tentacles internally. The overhanging lobe at extremity of the foot long and finely pointed. The right shell-lobe is very long and narrow, the left shell-lobe also narrow and long, triangular on a broad base. The left dorsal lobe is in two separate parts. *The visceral sac next the mantle-edge plain, with a few scattered small white dots, these are more numerous on the line of the rectum. Mingled with them is a larger speckling of black, and a mottled dark band borders the kidney; the rest of the visceral sac is black-brown, spotted very sparsely and minutely with white.* In another specimen the white spots were absent.

The radula (Pl. XX. fig. 2 c) is arranged thus:—

68 . 3 . 9 . 1 . 9 . 3 . 68, or 80 . 1 . 80.

The marginals are nearly evenly bicuspid, becoming very small on the extreme margin. The jaw (Pl. XX. fig. 2 c) is arched high in the centre, and has a small central projection on a rather straight edge.

I show the generative organs (Pl. XX. fig. 2) with the penis rolled together, as in Part II., pl. xiii. fig. 7 of *P. phædimus*, with the end of the flagellum encircling the accessory gland—unrolled it is like that species. The



spermatheca was very large and swollen at the free end. This appearance indicated a spermatophore (Pl. XX. fig. 2 a) was within it, and with great care I managed to extract it nearly complete. The spines, however, were all broken off except one; there were only fifteen, less than in others I have seen, all on one side ( $\frac{0}{15}$ ). This, and its shorter flume, is a good specific character. The single spine entire is simple, biid.

*Kerkophorus ? natalensis*, Kr.=3388.

*Locality.* Equeefa, Natal (No. 13, *H. C. Burnup*, B.M., spirit-specimen no. 9).

Shell very globosely conoid, imperforate, shiny, very thin, transparent; sculpture microscopic, fine regular striation;

Fig. 1.



colour ochraceous, with a greenish tinge; spire bluntly conoid; suture impressed; whorls 4, the last very large and rounded; aperture broadly lunate, oblique.

Size: major diam. 13·0, minor 11·25; alt. axis 7 mm.

Animal pale-coloured, grey on side of the foot, towards the extremity. The lobe above this long. Right shell-lobe long, of nearly even breadth for some distance, then tapering. The left shell-lobe long, tongue-like, narrow. The left dorsal lobe in two parts. *The branchial sac sparsely and finely dotted up to the liver and heart; white speckling then commences and continues to the apex, on an ashy ground.*

Formula of the radula: 94.2.11.1.11.2.94, or 107.1.107. A few of the marginal teeth are tricuspid, the rest are unevenly bicuspid. Admedian as usual.

Jaw with a central projection.

There were three spermatophores in the specimen dissected. Nineteen bunched spines on one side of the flume, three on the other, next the capsule ( $\frac{3}{19}$ ).

*Kerkophorus ? natalensis*, Krs. (Part II., pl. xv. figs. 1-1 d, animal and anatomy.)

*Vide* Ann. & Mag. Nat. Hist. ser. 8, vol. ix. p. 584 (1912), explanation of plate xv., not *ampliatius*.

*Locality.* Alexandra Park, Maritzburg (No. 7, H. G. Burnup, B.M., spirit-specimen no. 5; four examples) \*.

Shell very globosely conoid, very finely perforate; sculpture microscopical, regular longitudinal striation; colour ochraceous, with a strong yellow tinge; spire subconic, apex rounded; suture moderately impressed; whorls 4, the last swollen and rounded on the periphery; aperture very circular, oblique; peristome thin, sinuated; columellar margin nearly vertical, thin.

Size: major diam. 13.0, minor 11.3; alt. axis 5.0 mm.

Second example sent: major diam. 14.3; alt. axis 8.0 mm.

*Animal* (pl. xv. figs. 1-1 a). — With elongate lobe at extremity of foot. Right and left shell-lobes large, long, and tongue-like. Left dorsal lobe in two parts, in three in one specimen. *Visceral sac all pale-coloured up to the region of the heart and kidney, with no spotting of black or white whatever, thence to the apical whorls all very dark brown with just an indication of white mottling on the side near the apex.*

Mr. Burnup writes of this species, which certainly differs from *phaedmus* in the coloration of the animal and in

\* After the publication of Part II., 1912, Burnup sent another specimen of the shell to Ponsouby, which came on to me; it bears this note: "This equals my No. 7 to G.-A., which he apparently considers is *ampliatius*!!" It is a finer specimen, and I give its dimensions (second example); it is rather higher in the spire than the first specimen I received—this represents *natalensis* at Maritzburg apparently.

narrower shell-lobes, "Approaching the forms timidly known as *H. natalensis* and *H. poeppigi*, but possibly distinct." It is very close to No. 3245 (*bicolor*), but the shell of that species has a narrower peripheral band. More mature specimens of this species are required, and they should be compared with *K. natalensis* from Durban or its neighbourhood.

From another specimen.

*Locality.* Maritzburg (*Henry C. Burnup*), 21. iii. 08.

*Animal.*—Visceral sac. *Wall of branchial cavity pale-coloured with no marking, beyond a slight dark streak above the kidney. Behind the heart dark grey sparsely spotted white, merging into dark brown on apex, with the sutural margin bordered whitish.* Foot with a long horn over the mucous gland, well-defined peripodial grooves, with others leading from them to the keel. Right shell-lobe long, broadish, given off considerably below the rectum. The left is small, triangular. Left dorsal lobe long and narrow, in two separate parts of about equal length.

The generative organs may be compared with those of *K. phædimus*. The penis is bent on itself in S-shape, the flagellum long. I give a drawing of its position as packed within the animal and adjacent to the spermatheca (pl. xv. (fig. 1 b), shown again after extraction (pl. xv. fig. 1 c). The free oviduct is not black as in *K. phædimus* (ot.). There was a single spermatophore (Part II., pl. xv. fig. 1 d), quite perfect. This has six spines on one side next the capsule, with twenty-one on the other side ( $\frac{6}{21}$ ). Their elongate form may be compared with those of No. 3379, *K. poeppigi*, from Pinetown, near Durban. The branching is something like those of *phædimus*, but far longer. These three species are evidently very close to each other, the shell-lobes differing in breadth and length. Compare figures of *phædimus* on pl. xiii. figs. 1–2, No. 3379, pl. ii. figs. 3, 3 a, and No. 7, pl. xv. figs. 1, 1 a.

The radula shows a formula:—

70 . 3 . 12 . 1 . 12 . 3 . 70, or 85 . 1 . 85.

The centrals of usual type, the laterals all *evenly bicuspid*, becoming very small on the outer margin.

Jaw with a central projection.

*Zonamydrus*, M. & P., and *subcorneus*, Preston, appear to be identical, and are very near this species of the *natalensis*, Krauss, type of shell, quite smooth on the apical whorls.

*Kerkophorus bicolor*, sp. n. (Part I., pl. i. figs. 1, 1 *a*, 1 *b* ; Pl. XIX. figs. 1-1 *c*.)

*Locality.* Town Bush, Maritzburg ; only one specimen received.

Shell globosely conoid, imperforate, shiny ; sculpture very nearly smooth, just an indication of irregular longitudinal striation ; colour very ruddy brown as far as a fine brown band just above the periphery, pale and olivaceous below this band (the difference is striking) ; spire depressedly conoid, apex rounded ; suture moderately impressed ; whorls 4, the last expanded, rounded on the periphery ; aperture ovate, about as broad as high ; peristome thin ; columellar margin not thickened, slightly curved.

Size: major diam. 13·0, minor 11·20 ; alt. axis 6·5 mm.

*Animal* (Part I., pl. i. figs. 1, 1 *a*).—In excellent preservation. The lobe over mucous gland large and standing up. The right shell-lobe is long, wide at base, tapering gradually to a point ; the left (fig. 1 *b*, *lsl*) is given off from a narrow band, which overlaps the peristome and is broad at base and elongately triangular in shape. The left dorsal lobe is in two distinct parts, the anterior the longest and narrow. The wall of the branchial sac (pl. i. (*br*) fig. 1 *b*) is pale vinous, with a few black specks. *The kidney is bordered by black bands ; posteriorly the visceral sac is black ; the liver-whorls to apex dark brown, with a few distant minute white spots.*

In the generative organs (Pl. XIX. fig. 1) the penis-sheath is large and bulbous near the aperture, the retractor muscle is short and thick ; the flagellum short, there is an accessory organ globose at end of a short duct. The spermatheca large, oval, on a strong large duct. The free oviduct is very black, as in *inunctus* and *phædimus*. The spermatophore (Pl. XIX. fig. 1 *b*) has a short rather thickened flume closely set with bifid spines, fourteen anterior and about seventeen posterior. There are thirty-two in a second example, and the first four or five are on both sides of the flume next the capsule, most of which were broken off unfortunately, so that their form could only be taken from five or six that were perfect ; these were bifid close to base and bifid at the points, thus similar in this respect to No. 12 from Equeefa (pl. iv. fig. 2 *a*). The long whip-like portion was given off near the posterior termination of the flume.

The radula (Pl. XIX. fig. 1 *c*) of this species differs from all I have as yet dissected, but approaches *K. inunctus*. Centre and admedians as usual ; the laterals are long and

curved, approaching the aculeate form, but are all bicuspid ; the outer cusp small and very much below the point, the cusp becoming notch-like and almost disappearing in the smaller teeth next the margin itself. Formula:—

? 58 . 2 . 14 . 1 . 14 . 2 . 58 ?, or + 64 . 1 . 64 +.

Unfortunately in extracting the radula the laterals were broken away from the centre position, and thus their exact number could not be counted ; but it does not very much exceed fifty-eight.

Three specimens have since been recorded by Mr. Burnup taken in the same locality : one is darker—that is, on the visceral sac there is rather more black marking and no white specks towards the apex ; the two others have less black mottling and fine spotting.

With the second lot of this species Mr. Burnup, writing to Mr. John Ponsonby, says:—"As this is one of our darkest *Helicarions*, I don't think it likely to be *corneus*, Pfr., which is described as pale horn-colour. Anyone describing the shell would be bound to observe the difference in shade above and below the peripheral band. The same feature is observable less conspicuously in the *Tongaat* form (= G. A. 24)."

*Kerkophorus bicolor*, sp. n.

*Locality.* Townbush, Maritzburg (No. 3418, *Burnup*).

*Animal.*—The further specimens received have a tinge of pale sap-green. The lobe over the mucous gland is very long and pointed, similar to *Kerkophorus phædimus*. The right shell-lobe is moderately narrow, long and attenuate, and thus differs from *K. phædimus* and also from *tongaatensis* ; the left shell-lobe elongately triangular, rather broad at base, as in No. 15, *K. burnupi*, and 3379. In the visceral sac the apical whorls are brown, the branchial wall sparsely spotted or splashed with black ; a conspicuous black band above the region of the heart, a very few distant white specks on the succeeding portion up to the apex.

Generative organs as in No. 12 ; the free oviduct pink, very conspicuous.

Jaw with no central projection.

Radula formula:—

+ 26 . 2 . 14 . 1 . 14 . 2 . 26 +, or + 42 . 1 . 42 +.

Teeth of usual form, the marginals bicuspid, the inner cusp the longest, outermost becoming very minute.

*Kerkophorus tongaatensis*, sp. n.

*Locality.* Tongaat (*H. C. Burnup*), January 1909.

Shell very narrowly perforate, globosely conoid; sculpture very fine, but distinct longitudinal striation, finer towards the last whorl; colour rich sienna-brown, decidedly darker above than below, the dividing-line being the sutural band; spire, apex bluntly conic; suture impressed; whorls 4, apical small, the last very ample, a faint narrow sutural band just above the periphery; aperture ovately lunate, decidedly oblique; peristome thin, a slight callus on inner side; columellar margin just slightly reflected at perforation, nearly vertical, then oblique.

Size: major diam. 14.75, minor 12.5; alt. axis 6.25 mm.

A smaller shell of animal dissected was 12.0 mm. in major diameter, but agrees in every way with the type above described, and was from the same locality.

*Animal.*—With a greenish tint, on the extremity of the foot darkish grey, in all the specimens received. The right shell-lobe is broad and large, as in *K. phædimus* (pl. xiii. fig. 2); the left shell-lobe, however, is not broad and square as in that species, *but broad and very elongated*; left dorsal lobe in two parts, the posterior the smallest; lobe above the mucous pore similarly elongate (pl. xiii. fig. 3). Colour brown throughout, dark grey on hinder part of foot, a few black specks near the mantle-edge, and a black bar above the kidney. Shell-lobes are far smaller than in *K. melvilli*. The radula formula is

$$+36 . 2 . 13 . 1 . 13 . 2 . 36 + .$$

The marginal teeth not quite complete, similar to that of *K. melvilli* (pl. vii. figs. 1*b-d*). The two transition-teeth have the outer cusp higher than in the preceding tooth; in the next outer tooth the cusp is still nearer the point, and thence up to the margin it is not seen at all, all being curved *and aculeate in shape, becoming small and narrower next the margin*, and a few here show a bicuspid point.

Jaw with a central projection.

In the genitalia the shaft of the penis is short and thickened, with the **S** folds bound together and concealed.

In the specimen dissected out of the smallest shell mentioned above, only the remains of a spermatophore were found in the spermatheca. In another specimen I was fortunate enough to find one quite perfect. The flume next the capsule has 8 main spines, while on the other side in a continuous row there are 25, which I render by  $\frac{8}{25}$ ; it ter-

minates in a slender whip-like form to a fine point. These spines are bunch-like, several branches given off on a thick stem. It is of the type of *K. vitalis* (pl. xv. fig. 2, Part II.), but only a drawing enlarged to the same size would show properly and clearly the amount of diversity, which, as regards spine-distribution, is  $\frac{8}{25} : \frac{2}{27}$ . It is impossible to do this, as the number of plates would be excessive.

Burnup, when sending this species and writing from Tongaat on 18th January, 1909, says :—

“The *Helicarion* sp. ? scarcely agrees with anything that I know (speaking from memory, for I am away from all opportunity of comparing), but it seems nearest to the specimen, which you will now have, sent to me by Mr. Ponsonby as No. 3345, which has more than once, but I should say probably erroneously, been identified as *H. corneus*, Pfr.”

It is very close to that species, but the anatomy is not quite the same, shown particularly in the radula and spermatophore.

*Kerkophorus ampliata*, M. & P. (not *K. ampliata*, Part II., p. 584, pl. xv.)

*Locality.* Stellabush, Durban (No. 3544, *H. C. Burnup*, B.M. no. 6).

Ann. & Mag. Nat. Hist. ser. 7, vol. iv. (Sept. 1899) pl. iii. fig. 5.  
Annals S. A. Mus. (1912) p. 107.

Original description :—

“*Zingis ampliata*, sp. n.

“*Z. testa nitidissima*, minute perforata, perlævi, tenui, globulari, succineo-olivacea; anfractus 4, apud suturas distincte impressis, ultimo magno, rapide accrescente, effuso; apertura late ovato-rotundata; peristomate tenui, columella alba vix incrassata, super umbilicum minutum reflexa.

“Alt. 12, diam. 16 mm.”

Size of shell, animal dissected: major diam. 17·8, alt. axis 9·75 mm.

*Animal.*—Colour generally pale ruddy ochraceous, tentacles grey, and darker on head and neck. The posterior half of the foot dark greenish grey, including the long attenuate horn above the mucous pore. Wall of the branchial sac pale-coloured, with a few very fine scattered specklings. A well-defined black band above the kidney. *Visceral sac*

*with no special markings, dark greenish in colour, with fine white ramifying venation conspicuous. Vinous tinted in part nearer the apex, which is, again, darker. Right shell-lobe very long, in the one dissected 15 mm., similar to No. 7; the left shell-lobe is longer than in No. 7, not so triangular. The right dorsal lobe is small, the left dorsal in two parts, the posterior one the smallest. The penis is a short stout pillar, closely bent in S shape, the flagellum very long, cæcum well developed, all the rest of the genitalia on usual plan.*

Jaw with a central projection.

Radula extracted almost complete, the formula

70 . 2 . 15 . 1 . 15 . 2 . 70, or 87 . 1 . 87.

Central and admedians in form as in species of the genus, the *marginals aculeate*, diminishing to very minute teeth on the edge.

*Kerkophorus stellatus*, sp. n.

*Locality.* Stellabush, Durban (No. 3629, Burnup Coll.).

Shell globosely conoid, imperforate, apical whorls glassy; sculpture microscopic, longitudinal papillation; colour pale ochraceous straw-colour; spire moderately high, subconic; suture shallow; whorls 4, rapidly increasing, the last tumid, apex sides flat; aperture oblique, circular; peristome very thin; columellar margin thin, subvertical.

Size: major diam. 15.0; alt. axis 7 mm.

*Animal.*—General colour very pale grey, extending to the wall of the branchial sac. Horn above the mucous gland long, with a small black tip. Foot on sole divided. The right shell-lobe long and ample; left shell-lobe moderately long; right dorsal lobe large, left in two distinct parts, anterior large, posterior small. *The branchial sac is spotted sparsely with black, and a black triangular patch fills the angle next and above the anal and respiratory apertures. The usual dark band, but not very pronounced, lies above the kidney, and below and parallel with it is a milky-white band extending to the position of the heart; this is succeeded on the visceral sac, which is here of a pale ochraceous tint, by white spotting, which, again, merges into two narrow bands, next by a foliated pattern in white, and, finally, the two apical whorls are all white.*

Three large specimens were sent from which the shells had been removed, and one small immature example with shell. The above description applies to all of them.



The generative organs were similar to those previously described, the penis rolled up close as in pl. xiii. fig. 7. No spermatophore was found.

The jaw has a central projection, is not very concave on the cutting-edge.

The radula was secured, almost complete, the formula

97 . 2 . 11 . 1 . 11 . 2 . 97, or 110 . 1 . 110.

The central and admedian teeth as usual in the genus. The laterals are all alike, curved with bicuspid points, the inner points slightly the longest. They graduate into minute teeth on the margin.

This species was labelled by Mr. Burnup "*Compare K. melvilli*, G.-A." The radula distinguishes it at once from that species, in which the lateral teeth are aculeate. The radula is of the type seen in *phædimus* (p. 573).

*Kerkophorus zonamydrus*, M. & P.

Connolly, Annals S. A. Museum (1912), p. 110.

Original description (Ann. & Mag. N. H. ser. 6, vol. vi. p. 467, *Vitrina zonamydra*, M. & P.):—

"*V. testa globosa, convexa, robustiore quam V. cingulata, fuscescente, supra peripheriam obscure fusco-cingulata; spira convexa, ampliore quam in specie præcedente (V. cingulata); anfractibus ventricosis, lævibus; apertura subrotunda.*

"Long. 10, lat. 17 mill."

The form of this shell is very like that of the three examples of *K. natalensis*, Kr., in the Natural History Collection received from Cuming, which were decided to be the same as a typical example sent for comparison by Dr. Lampart from Stuttgart. The first two apical whorls are higher and not of same spiral.

Kowie (*C. Farquarson*).

A single specimen under the above name was received by me from Mr. John Ponsonby on the 5th July, 1913. I at once began the dissection and description of it.

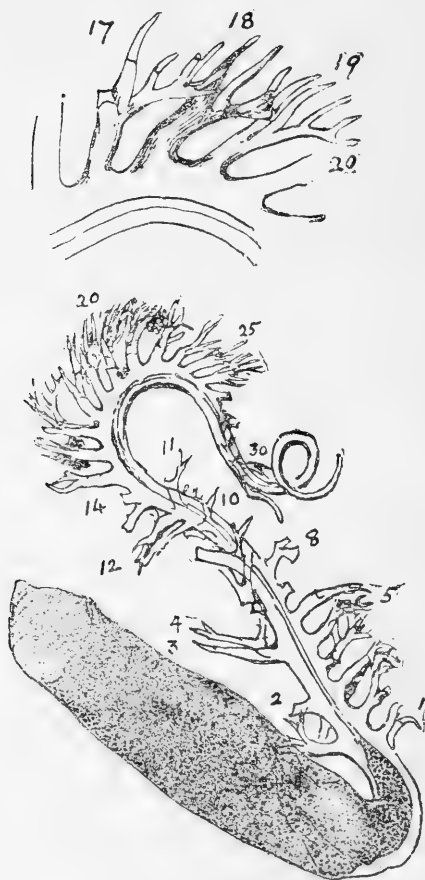
*Animal*.—Pale-coloured generally on the foot. Tentacles, head, and neck black, edge of this colour sharply defined. Peripodial margin well seen, and towards the extremity of the foot more distinctly so, in contrast to the darker-coloured surface lying above it. Right shell-lobe broad and rather long and pointed, the left shell-lobe very short and blunt. The lobe over the mucous gland fairly large and black-tipped,

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much contracted apparently in this specimen. Walls of the branchial sac with a white ground, with the usual jet-black conspicuous band above the kidney; there are several large quadrate spots towards the edge of the mantle, interspersed with minute spotting. Behind the region of the heart the

Fig. 2.



visceral sac is unspotted, greenish white, the apical portion containing the liver dull brown, and no spotting of any kind.

The spermatheca is a large bulbous mass with a long solid stalk. On cutting it open I found it contained a single

perfect spermatophore buried in a mass of thick mucus, out of which it was difficult and took a long time to clear, using a fine brush and needle-point. In doing this it is impossible to avoid breaking off many of the delicate spines. The spermatophore is not always thus enclosed in mucus, and may be found perfectly free and floating in a clear liquid. The capsule of this specimen is moderately long and cylindrical, the flume a little more than  $1\frac{1}{2}$  times as long, attenuate at the vas deferens end, having a shorter terminal end branching off below.

The sprigs, as they may be termed, carrying spines are very numerous on one side of the flume, thirty in number; on the opposite side there are only four, situated close to the capsule ( $\frac{4}{30}$ ).

The general form and proportion of its different parts differ in detail from those I have found and described in other species of this genus. The sprigs are set very close together on rather elongate substantial stems, and the stag's-horn character of those which are perfect, 17 . 18 . 19 (*vide* fig.), is not exactly what I have seen before, and approaches nearest to *K. vitalis*.

The radula is peculiar; the marginals are short, slightly curving, unevenly bicuspid, the outer cusp much below the inner, arranged thus—

80-100 . 3 . 15 . 1 . 15 . 80-100.

Jaw slightly arched, with a central projection.

*Kerkophorus burnupi*, sp. n. (Part I., pl. ii. figs. 2, 2 a, 2 b, animal; Pl. XX. figs. 1-1 b.)

*Locality.* Town Hill, Maritzburg (No. 15, *H. C. Burnup*); two specimens sent with shells.

Shell depressedly globose; colour nearly white, but with the palest tint of greenish blue; spire low, apex rounded; whorls 3, the last rapidly increasing and ample; aperture roundly lunate, about as broad as high, oblique; columellar margin not reflexed, curving, and nearly vertical.

Size: major diam. 10.0, minor 8.0; alt. axis 3.8 mm.

Mr. Burnup, in sending this species, says:—"This species has never been described (at least no description of the form has been published, though I believe Melvill and Ponsonby have it in MS., but are keeping it back). It has at different times been identified as *H. phædimus* and as *leucospira*; but I think it is quite distinct from these species."

It is not *phædimus*, for the apical coils of that species are dark brown, no white at all; *leuccospira* is, again, spotted with white over the branchial cavity.

Animal is pale throughout, *no spotting on the visceral sac*; when first looked at the colouring of the animal recalls that of *Peltatus pondoensis*; *but the contrast of the dark brown liver and white upper surface of the apical coils* and the form of the shell-lobes at once distinguish this species from the Pondoland one. The value of drawings over description to show differences of this nature is illustrated in this instance. The lobe over the mucous pore (fig. 2 *b*) is moderately large. The right shell-lobe (fig. 2) is long and broad, the left (fig. 2) elongate and triangular, on a wide base of the mantle-edge. In the drawing it is shown drooping over, not in its natural position, turned over the edge of the peristome and lying on the surface of the shell.

In the generative organs (Pl. XX. fig. 1) the penis has a long flagellum, which towards the free end bifurcates into two distinct branches. These are to be explained by a reference to the figures of spermatophores on pl. iii. fig. 1 *b*), where the usually single whip-like end has another and a finer one. Experience when dissecting has shown me this is very easily broken off.

The epiphallus is very long in this species, the short accessory organ being given off nearer to the retractor muscle than to the vas deferens. The spermatheca is on a long stalk, and, being empty, was more elongately pear-shaped.

The radula (Pl. XX. fig. 1 *b*) has the formula

$$46 \cdot 3 \cdot 7 \cdot 1 \cdot 7 \cdot 3 \cdot 46, \text{ or } 56 \cdot 1 \cdot 56.$$

Jaw (Pl. XX. fig. 1 *a*) with a central projection.

*Kerkophorus orientalis*, sp. n.?

*Locality.* East London (No. 10, *H. C. Burnup*); only one specimen sent.

Shell subglobosely conoid, thin; sculpture microscopic, close papillate longitudinal striation, crossed by distant lines of growth; colour very pale vinous; spire depressedly conoid, apex blunt; suture impressed; whorls 5, the last large; aperture widely lunate, oblique; peristome thin; columellar margin suboblique, not thickened, and just reflected near the umbilicus.

Size: major diam. 13·70, minor 12·00; alt. axis 6·30 mm.

Animal with a long tapering right shell-lobe, triangular in

shape, and a long triangular left shell-lobe. The left dorsal lobe in two distinct parts, the posterior one small; lobe over mucous gland must be elongate in life, but not so long as in *K. phædimus* &c. *The visceral sac is quite plain and unspotted over the branchial cavity; at the kidney, which is sienna-brown, there are a few fine black spots, and a short black band borders this organ. Towards and on the apical whorls there is indistinct whitish mottling.* It is quite distinct from the species sent with it from the same locality.

I refrain from dissecting the single specimen received, yet name it provisionally *K. orientalis*, for of this and the next species more examples are required, both of shell and animal, to come to a satisfactory conclusion as to their distinctness and nearest allies.

Burnup's note to this species is as follows:—"There appear to be 2 spp. here, but there should be no difficulty in deciding which animal belongs to each shell, as there are 2 of 1 sp. and 1 of the other; moreover, from the nature of the flatter shell I should unhesitatingly say that the animal with the large loose mantle belongs to it."

*Kerkophorus* ?, sp. n.

*Locality.* East London (No. 10 a, *H. C. Burnup*); two specimens received.

Shell very thin, globosely conoid, no perforation, shiny surface; colour strong straw-colour; spire flatly conoid; suture well impressed, apex defined; whorls 4, rapidly increasing, apical very convex; aperture nearly circular, or broadly circularly lunate, subvertical; peristome very thin; columellar margin curved, nearly vertical, very weak, no reflexion.

Size: major diam. 14·00, minor 12·0; alt. axis 6·00 mm.

Shell quite different from the preceding, flatter and less globose.

Animal pale-coloured in alcohol, with a long pointed lobe at extremity of the foot. *Visceral sac very pale ochraceous, passing to pale greenish grey at apex, spotted milky white, the spots larger towards apex, no black ones at all.*

The right shell-lobe long and narrow, and left similar.

The genitalia as in the genus. There is a sharp close bend in the penis-shaft; the accessory gland is short and sac-like, near the muscle-retractor. Flagellum long. Spermatheca on a short stalk, bulbous. Unfortunately it did not hold a spermatophore.

Radula not got out so well as to see a complete row and count the whole of the marginal teeth. The formula is

$$+45 \cdot 2 \cdot 12 \cdot 1 \cdot 12 \cdot 2 \cdot 45 +, \text{ or } +59 \cdot 1 \cdot 59 +.$$

The marginals nearly evenly bicuspid. The jaw with a central projection.

The young animal of a species (No. 3391) was sent me by John Ponsonby on 28th April, 1911, from the Game Pass, Mooi River, as *Kerkophorus ? transvaalensis*, Craven. I have not seen the shell. *Vide* 'Annals,' January 1912, p. 128. "New genus?"

The animal is distinct from anything else as yet received. *The visceral sac has the branchial wall very sparsely speckled with black on a pale ground, a narrow black line above the liver and heart, the apical whorls plain umber-brown with no mottling of any sort.*

The lobe over the mucous gland very long and dark-coloured, overhanging a straight closed slit. A trace of a right shell-lobe; its shape could not be seen, nor could I see any left shell-lobe. The left dorsal lobe in two well-separated parts.

The radula was got out complete; it has fewer admedian teeth than any as yet dissected, in form as usual, the marginals evenly bicuspid. Formula:—

$$32 \cdot 3 \cdot 6 \cdot 1 \cdot 6 \cdot 3 \cdot 32, \text{ or } 41 \cdot 1 \cdot 41.$$

The jaw rounded above, with a central projection.

### *Kerkophorus* sp.?

East London; a single specimen.

This species was sent to me on 20th March, 1913, by Major M. Connolly. The animal was dried up within the shell; but by leaving it to soak in water many useful characters were brought to light. There was the elongate lobe at the extremity of the foot; *the wall of the branchial sac was sparsely spotted with white on a pale ground, much more thickly so on the whorls and apical portion, larger spots running together; there was no sign of the large triangular white patch in the vicinity of the heart, so conspicuous in the specimens sent previously by Major Connolly from the same locality, and of which he thought this a bigger specimen of ? M. pondoensis.* The generative organs were not well preserved, and no spermatophore was

to be found. The jaw with radula complete was secured and mounted.

The jaw has a small central projection and the radula the formula :

$$\begin{array}{r} +60 . 2 . 12 . 1 . 12 . 2 . 60 + \\ +74 . 1 . 74 + . \end{array}$$

Genus MICROKERKUS (continued from p. 582, Part II.).

*Microkerkus fusicolor*, M. & P. (Part II., pl. xvi. figs. 2, 2a, 2b, parts of animal.)

*Kerkophorus fusicolor*, M. & P., Ann. S. A. Mus. p. 108.

*Locality.* Platberg, Harrismith, O.R.C. (received from Connolly per H. C. Burnup) (No. 8).

*Animal.*—The right shell-lobe somewhat broadly tongue-shaped and short, left shell-lobe small and tongue-shaped; left dorsal lobe in two parts, the posterior elongate and the longest. Foot pale-coloured, neck and tentacles grey, sole of foot not divided, small lobe above the triangular-shaped mucous pore, peripodial margin broad. *Wall of the branchial sac dusky black, mottled indistinctly with white. The kidney conspicuous by its pale ochraceous colour, which is bordered with black above. The visceral sac beyond this is whitish above and mottled black below.* Lobe above the mucous pore small, dorsal surface of foot flattened.

Mr. Barnup writes:—"A fine thing bearing a great resemblance both in shell and animal (externally) to No. 4 (*symmetricus*, Craven), but on a larger scale."

Ponsonby, in letter Nov. 1907, says this species appears as a *Natalina* in the last monograph of the Rhytididæ.

The radula teeth are arranged

$$60 . 3 . 14 . 1 . 14 . 3 . 60, \text{ or } 87 . 1 . 87 \text{ in the row.}$$

They are like others described in species of the family.

The marginals are unevenly bicuspid.

Jaw with a central projection.

In the genitalia the epiphallus is long, the accessory gland globose, on a short stalk. The spermatheca large and swollen, on a thick stalk. Flagellum not attenuate. The spermatophore: the capsule is long and narrow, and the flume bears spines quite unlike any I have found in allied species; there are two main branches, growing from same point close to the flume; from these, again, about eight curved spines are given off, gradually becoming shorter towards the tip of the branch.

There are 30 spines on one side, none on the other ( $\begin{smallmatrix} 0 \\ 30 \end{smallmatrix}$ ).

## EXPLANATION OF THE PLATES.

## PLATE XIX.

*Kerkophorus bicolor*, sp. n. Townbush, Maritzburg. (No. 3245.)Fig. 1. Generative organs, part of.  $\times 4.5$ .Fig. 1 a. Jaw.  $\times 12.4$ .Fig. 1 b. Spermatophore,  $\times 12.4$ , not complete, having lost the spines.  
A few of these were yet to be seen on the terminal end of the flume, and are shown enlarged 30 times.

Fig. 1 c. Teeth of the radula at different parts of the row.

*Microkerkus symmetricus*, Craven. (No. 4.)Fig. 2. Part of the generative organs.  $\times 4.5$ .Fig. 2 a. A portion of the spermatophore, showing the branched antler-like spines.  $\times 30$ .Fig. 2 b. The jaw.  $\times 12$ .Fig. 2 c. Anterior teeth of the radula,  $\times 700$ , 50th to 56th.

## PLATE XX.

*Kerkophorus burnupi*, sp. n. Maritzburg. (No. 15.)Fig. 1. The generative organs.  $\times 8$ .Fig. 1 a. Jaw.  $\times 12.5$ .Fig. 1 b. Teeth of radula at different parts of the row.  $\times 368$ .*Kerkophorus ? natalensis*, sp. n. Equeefa.Fig. 2. Part of the genitalia.  $\times 4.5$ .Fig. 2 a. Spermatophore, portion of ( $\times 12.5$ ), with spine ( $\times 30$ ).

Fig. 2 b. Jaw.

Fig. 2 c. Teeth of radula at different parts of the row.  $\times 368$ .LIII.—*Description of a Harpacticid Copepod parasitic on an Octopus.* By G. P. FARRAN.

[Plate XXI.]

IN 1906 a specimen of the deep-water octopus, *Polypus ergasticus*, was trawled by the Department of Agriculture's steam cruiser 'Helga' in 610–680 fathoms off the S.W. coast of Ireland (Station S.R. 331; see 'Fisheries, Ireland, Sci. Invest.' 1907, i. [1909]), and was handed to Miss A. L. Massy, who was working at the Department's collection of Cephalopoda. On examining it Miss Massy noticed that on the inside of the arm-membranes were what appeared to be numerous small white villi or spinules. On closer inspection



these proved to be minute copepods, attached by their mouth-appendages to the skin of the octopus, their tail-ends being free. All the specimens found were females, most of them with egg-sacs. They appear to belong to a new genus of the Harpacticoidæ, most nearly allied to the genus *Idya*, but greatly modified for a parasitic life. It may, perhaps, be held that a new family should be made for the genus, but as all the appendages which have not undergone degeneration have retained, to a greater or less degree, their *Idya*-like form, I have placed it in the same family as *Idya*.

The genus and species may be described as follows :—

### Family Idyidæ.

#### Genus CHOLIDYA, nov.

An Idyoid, modified for a parasitic life, in which the swimming appendages are reduced or absent and the cephalon and thorax soft and swollen. Cephalic appendages with the same general structure as in the rest of the family. Inner ramus of the second antenna very small. Mandible with an unbranched palp. First maxilla forming a simple piercer. First foot reduced in size, but of the same form as in the genus *Idya*. Second foot two-branched, but with its joints and setæ reduced. Third and fourth feet absent. Fifth feet highly chitinized and ventral in position, connected by a chitinized ventral plate. Abdomen not chitinized and with feebly marked segmentation. Egg-sac one, attached.

#### *Cholidya polypi*, sp. n.

Female (fig. 1) length .78-.8 mm. Cephalon slightly flattened. Thorax globular, swollen, filled with what appears to be undifferentiated food or yolk-material. Abdomen tapering from the swollen thorax to the small furca.

First antenna (fig. 2) six-jointed, the fourth joint bearing a short æsthetask; proportional length of joints, measured along the upper margin :—

|    |    |    |   |   |   |
|----|----|----|---|---|---|
| 1  | 2  | 3  | 4 | 5 | 6 |
| 10 | 23 | 12 | 8 | 7 | 7 |

Second antenna (fig. 3) with two basal joints; endopodite very small, with two terminal setæ; exopodite two-jointed, second joint about half as long as the first and bearing one lateral and four terminal setæ.

Mandible (fig. 4) with a strong three-toothed cutting-blade; palp very small, unbranched, with four setæ.

First maxilla (fig. 5) appears to consist of a flattened plate with a curved point; no setæ or lobes could be made out, but they may have escaped notice.

Second maxilla (fig. 6) two-jointed, cheliform, the claw finely denticulated on the inner edge.

Maxillipede (fig. 7) with basal joint and chela as in the second maxilla, but with a stronger and sharper claw and a more muscular basal joint.

First foot (fig. 8) very small and feebly chitinized. It is of the same structure as in the genus *Idya*, and the musculature of the exopodite is well developed. The length of the first foot in *Idya furcata* is about two-fifths of the total length of the animal; in the present species it is about one-eighth.

Second foot (fig. 9) very minute, with two-jointed exopodite and endopodite, the former with two outer-edge and two terminal setæ, the latter with one outer-edge and two terminal setæ. The muscles in the second basal joint which move the exopodite are fairly well developed.

Third and fourth feet absent.

Fifth feet (fig. 10) strongly chitinized, ending in six stout denticulations, of which the innermost bears a small seta, outer edge with one seta set back a little from the margin on the posterior face, inner edge with two setæ situated close together near the point of attachment of the foot, and distal to them a pore in the chitinous margin of the foot which seems to be the mouth of a gland. The fifth feet are articulated to either end of a broad, chitinous, transverse ventral plate. The two inner-edge setæ of the fifth foot of this species seem to correspond morphologically to the two or three setæ on the basal joint of the fifth foot of *Idya*, the two joints in *Cholidya* having become fused.

Genital openings (fig. 11) as in the genus *Idya*, except that the minute setæ lateral to the oviducal opening are absent. The spermatheca is situated a short distance behind the oviducal opening, and has a short sigmoid duct terminating at the indistinct furrow, which marks the fusion of the first and second abdominal segments.

Rami of furca (fig. 12) about one and a half times as long as broad, with one short stout terminal and two lateral setæ.

Egg-sac single, containing a small number of comparatively large eggs. It is flask-shaped and attached to the oviducal opening by its narrow neck.

*Hab.* Attached to the inner face of the arm-membrane of

*Polypus ergasticus* from the west coast of Ireland, 600–700 fathoms.

The occurrence of a parasitic Harpacticid in the unusual situation in which this species was found, though not so strange as is the case of *Balænoophilus*, described by Auri-villius from the baleen plates of the blue whale, is not without interest, and the two species may well be compared. In both instances we have isolated species belonging to, or closely allied to, non-parasitic families, specially modified for an unusual manner of life. In *Cholidya* the modification has gone much further than in *Balænoophilus*, and, had not the first pair of feet remained unmodified, the relationship to *Idya* might have been overlooked, as most of the other appendages, taken separately, are common to other groups, both parasitic and free-living. In *Balænoophilus*, on the other hand, the adaptations to its peculiar mode of life are so slight that its relationship to *Harpacticus* is at once apparent, and it would be difficult to make sure that it had a parasitic habit were its place of origin unknown. The genus *Idya*, by the possession of strongly chelate maxillæ and maxillipedes, seems well adapted to give rise to a parasitic race, as the means of attachment are already present.

These instances of parasitic forms—as it were, in the making—throw some light on the origin of the various families of parasitic Copepoda in general, many of which, it is probable, have started independently as modifications of widely separated non-parasitic species.

#### EXPLANATION OF PLATE XXI.

|          |                             |                   |
|----------|-----------------------------|-------------------|
| Fig. 1.  | <i>Cholidya polypi</i> , ♀. | Ventral view.     |
| Fig. 2.  | " "                         | First antenna.    |
| Fig. 3.  | " "                         | Second antenna.   |
| Fig. 4.  | " "                         | Mandible.         |
| Fig. 5.  | " "                         | First maxilla.    |
| Fig. 6.  | " "                         | Second maxilla.   |
| Fig. 7.  | " "                         | Maxillipede.      |
| Fig. 8.  | " "                         | First foot.       |
| Fig. 9.  | " "                         | Second foot.      |
| Fig. 10. | " "                         | Fifth foot.       |
| Fig. 11. | " "                         | Genital openings. |
| Fig. 12. | " "                         | Furca.            |

LIV.—*Species of Tabanus from Polynesia in the British Museum and in the late Mr. Verrall's Collection.* By GERTRUDE RICARDO.

VERY few species have been described from this region.

From New Caledonia: *T. albonotatus*, Bigot, now changed to *T. caledonicus*, as the original name is preoccupied—this species belongs to Group IX. (see 'Indian Records,' iv. p. 114, 1911), with paler bands and spots on abdomen.

From Lifu Island: *T. lifuensis*, Bigot, belonging to Group X., with the abdomen unicolorous.

From New Hebrides: *T. expulsus*, Wlk.—this type is not to be found in the Brit. Mus. Coll.

From Sidney Island in the Phoenix Islands: *T. sidneyensis* and *T. nigriventris*, Macquart—I have not been able to trace either of these types, the latter is said to have hairy eyes.

This Sidney Island is mentioned by Macquart in his introduction to the 1st Supplement of Dipt. Exot. p. 134, as supplying some species common to Tasmania. Australia is wrongly given as the locality in Kertész' Cat., Sidney the town evidently being confused with this island.

From the Sandwich Islands: *T. insularis*, Wlk.—this type is not to be found in the Brit. Mus. Coll.

Two new species are now described, both belonging to Group IX., viz.:—

*Tabanus fjiianus* from Fiji and New Hebrides.

*Tabanus rubricollosus* from New Caledonia.

*Tabanus lifuensis*, Bigot.

Mém. Soc. Zool. de France, v. p. 689 (1892).

Type, a male in the late Mr. Verrall's coll. from the island of Lifu.

A medium-sized reddish species. *Antennæ* reddish, the first two joints with black hairs, the third joint is destroyed. *Face* chamois-leather colour, with rather long brown hairs. *Palpi* reddish yellow, with black hairs. *Eyes* bare, occupying the greater part of head, the large facets reaching beyond the apex of frontal triangle, and almost reaching the vertex. *Thorax* and *abdomen* dull reddish, the former with dark stripes, sides and breast the same colour as face, pubescence on abdomen appears to be chiefly black, consisting of short pubescence, sides with yellow hairs; underside same as

dorsum. *Legs* reddish, lighter in colour than abdomen. *Wings* clear, yellow on fore border; stigma yellow; veins yellowish.

Length 12 mm.

*Tabanus caledonicus*, Ricardo.

*Atylotus albonotatus*, Bigot, Mém. Soc. Zool. de France, v. p. 670 (1892), nomen bis lectum.

Type, a female in the late Mr. Verrall's coll. from New Caledonia; and a male and female erroneously labelled *T. lifuensis*, Ins. Lifu, on one of Bigot's original labels, but undoubtedly identical with this type.

A stout-bodied brown species with wings tinged brown.

*Female*.—*Face* covered with brownish-yellow tomentum, a few short brown hairs on cheeks. Beard composed of brown hairs with a few yellowish ones intermixed. *Palpi* reddish yellow with black hairs, long, almost the same width throughout, ending in a long point. *Antennæ* dull reddish yellow, the first two joints with black hairs, the third long and slender, with a very short (not wide) base, with a small but acute angle representing the tooth, the remaining part narrow. Subcallus same colour as face. *Forehead* parallel, about five times as long as it is broad; the frontal callus large, almost square, not reaching the eyes, continued in a short point, yellowish in colour; the rest of the forehead is entirely shining brown, rather protuberant. Eyes bare. *Thorax* brownish with yellow tomentum, which causes the brown to appear as stripes. Scutellum reddish brown. Breast-sides with thick tufts of black hairs. *Abdomen* brown, in the type with very narrow pale segmentations, and on each segment a median bluntly triangular pale spot; in the other female these spots are covered with white hairs, and the segmentations are less distinct; underside brown with white-haired segmentations. *Legs* brownish, the femora reddish below, tibiæ dull reddish. *Wings* large, tinged with brown, leaving the discal and basal cells somewhat paler, also the apex; veins brown; stigma reddish brown.

Length 20 mm.

*Male*.—Identical. The large facets restricted to upper part of eyes and not very large, though quite distinct. On the underside of abdomen the white hairs are restricted to the sides.

Length 21 mm.

*Tabanus rubricallosus*, ♀, sp. n.

Type (a female) and another female from New Caledonia.

A brown species covered with grey tomentum, easily distinguished by the large, shining, red, frontal callus and by the slender palpi.

Length 15 mm.

Face covered with whitish tomentum and with some short white pubescence. *Beard* white. *Palpi* pale yellow, some grey tomentum on base and on upper side; pubescence rather thick, a few short black hairs on upper side, otherwise the pubescence is white; in shape they are long and slender, ending in an attenuated point. *Antennæ* brown, the first two joints rather reddish with black hairs, the third joint stout with a small tooth. *Forehead* parallel, broad, about three times as long as it is broad, covered with same coloured tomentum as face; the frontal callus is shining red-brown, very large, reaching the eyes, anteriorly it encroaches on the subcallus, with a very convex border, posteriorly the border is irregular, and the sides slightly withdrawn from the border of eyes. *Thorax* black, covered with ashy-grey tomentum, leaving the ground-colour apparent as stripes; pubescence on anterior border white, elsewhere black; tufts of white hairs are present at base of wings and on breast-sides. *Scutellum* same as thorax. *Abdomen* brownish, densely covered with ashy-grey tomentum, which covers the posterior half of each segment, extending in the middle as a median triangular spot—it covers the first segment almost entirely; the anterior half of most segments has yellowish tomentum, the pubescence even on the grey borders is black, though short; underside wholly covered with grey tomentum. *Legs* brownish, the femora covered with grey tomentum, the tibiæ reddish. *Wings* clear; stigma very small, yellowish; veins reddish brown.

*Tabanus fujianus*, ♀, sp. n.

Type, a female from Fiji (*C. Knowles*), 1906, another female from Suva, Fiji, 16.1.1906 (*Dr. B. G. Corney*), with a note from donor, viz., "Annoys horses and cattle along a road through forest and open reed country."

Another female from Highlands of Fiji Govt. Station, alt. 2700 ft. (*Dr. B. G. Corney*), 1906.

Another female, the property of Prof. Nuttall, was caught feeding on hand in full sunshine on Lami River, Vitilevu, Fiji, Feb. 26, 1910, at 2 P.M.

A brown species marked with yellow-haired spots and segmentations on abdomen. Wings clouded on the cross-veins. Antennæ and legs reddish yellow.

Length, type 15 mm., others 13–15 mm.

*Face* covered with greyish tomentum, becoming yellowish on the upper border of cheeks and on subcallus; some long whitish hairs in centre of face and brown ones on cheeks. Beard white. *Palpi* yellow, covered with grey tomentum and with black pubescence, fairly stout, ending in a long obtuse point. *Antennæ* yellow, the first two joints with black hairs, the third slender, with a slight tooth, dusky at apex. *Forehead* almost parallel, about six times as long as it is broad, covered with yellowish tomentum; the frontal callus blackish, pear-shaped, not reaching the eyes, with a lineal extension extending more than half the length of the forehead. Eyes bare. *Thorax* brownish with black markings and with two yellow tomentose submedian stripes, sides also yellow, pubescence not very noticeable, some yellow hairs on the lighter-coloured parts and some brown ones on the dark parts, sides with black hairs, breast covered with grey tomentum and with yellow hairs. Scutellum brown with yellow tomentum and some yellow and black hairs. *Abdomen* reddish brown with some black markings, and with yellow tomentose segmentations and median triangular spots, all covered with yellow pubescence; underside almost wholly covered with the yellow tomentum and pubescence. *Legs* reddish yellow, most of the femora darker, with grey tomentum; apices of tibiæ and the tarsi brown; pubescence on legs chiefly yellow. *Wings* grey, pale yellow on fore border, all the transverse veins clouded with dark brown colouring; stigma yellow; veins brown.

Four females from Aneiteum, New Hebrides, appear to belong to this species, being probably a local form of it, the differences being very slight, as follows:—*Palpi* rather less stout at base. *Thorax* darker, the tomentum being grey instead of yellow. Scutellum the same. *Abdomen* the same, but the median spots are not so distinct. *Legs* paler, almost a uniform reddish yellow. *Wings* clouded with brown on fore border and along the veins, besides the transverse veins.

These specimens were labelled by Walker "*signifera*," New Hebrides, but the description of them does not appear to have been published.

LV.—*New Callicebus and Eumops from S. America.*  
By OLDFIELD THOMAS.

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*Callicebus toppini*, sp. n.

Allied to and of the same grizzled brown colour as *C. cupreus*. Crown-hairs similarly tipped with buffy, but along the front edge of the hairy part of the forehead the hairs are black, thus forming an indistinct blackish frontal band. Belly and terminal part of limbs red, as in *cupreus*, but on the hind legs the red is rather more extended, coming up to cover the knee. Hairs on ears dark reddish brown. Tail-hairs mixed grey and blackish, as in *cupreus*, but those on the proximal two-thirds are tipped with black, not with white or buffy as in the other species of this group.

Dimensions of skull :—

Greatest length 65·6 mm. ; basal length 50 ; breadth of brain-case 35·5 ; premolars and molars together 15·2.

*Hab.* Rio Tahuamanu, N.E. Peru, near Bolivian Boundary. About 12° 20' S., 68° 45' W.

*Type.* Adult female. B.M. no. 14. 3. 3. 3. Collected and presented by Capt. H. S. Toppin.

From all the members of the group with reddish ears this species may be distinguished by the dark tips to its caudal hairs. *C. cupreus* has also no black hairs on the forehead, while *C. ustro-fuscus*, which is darker throughout, has many more. *C. penulatus* has an elongated mantle, paler than the rest of the back.

I have named the species in honour of Capt. Toppin, who, in spite of great climatic difficulties, succeeded in bringing home for the National Museum several mammals from an almost unknown part of S. America.

*Eumops dabbenei*, sp. n.

The largest American Molossine bat, exceeding *E. perotis* in forearm and skull-length.

Size large, the body thick and clumsy, forearms not long in proportion to the bulky body and broad head. Ears of about normal size, not greatly enlarged, as in *perotis* (they are, however, thickened in both specimens, and may have



been accidentally or pathologically shrunk). Keel of ear-conch much thickened terminally. Tragus narrower than in *perotis*, about  $3 \times 1$  mm.; its end rounded. Antitragus about 8 mm. in length, separated by a deep notch behind. A large throat-gland in male, none in female.

Colour brown above and below, the bases of the hairs whitish.

Skull of very similar form to that of *E. glaucinus*, although immensely larger—much broader and more heavily made than that of the only species approaching it in size, *E. perotis*. Muzzle low, rounded, subcylindrical. Zygomatic with laterally projecting shoulders above  $m^3$ , just as in *glaucinus*. Mesial crest well defined, though not high, passing behind into a well-marked occipital helmet.

Dimensions of male and female specimens (the latter the type):—

Forearm 82 and 79 mm.

Head and body 115, 106; tail 61, 59; ear (perhaps shrunk) 28, 27; third finger, metacarpus 83, 77, first phalanx 37, 33; lower leg and hind foot (c. u.) 45, 41.

Skull: greatest length 33·5, 31; condylo-incisive length 32·3, 30·7; condylo-basal length 31·5, 29·4; zygomatic breadth 20·4, 29·4; intertemporal breadth 6·1, 5·7; mastoid breadth 17·5, 16·3; palatal length 14, 14·2; maxillary tooth-row 13·7, 13·2; front of  $p^4$  to back of  $m^2$  8·7, 8·6; breadth between outer corners of  $m^3$  14·2, 13·4.

*Hab.* Chaco, Argentina.

Two specimens, male and female, received for examination from the Museo Nacional, Buenos Ayres. The female presented to the British Museum (B.M. no. 14. 4. 4. 8).

This fine species is by far the largest of all American Molossidæ, the only one that approaches it in length of forearm and skull, *E. perotis*, being a far more slenderly built animal, with a peculiarly narrow skull. Compared with Old-World Molossines, it exceeds all except *Chiromeles torquatus*, and that it practically equals in length of forearm and skull, though *Chiromeles* is far more bulky.

I have named this interesting animal in honour of Dr. R. Dabbene, Conservator of Zoology in the Buenos Ayres National Museum, to whose kindness I owe the opportunity of examining it.

LVI.—*On the Fabrician Types of Tenebrionidæ (Coleoptera) in the Banks Collection.* By K. G. BLAIR.

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THIS paper is supplementary to that published by Gebien in *Deutsch. Ent. Zeitschr.* 1906, p. 209, in which he contributed notes on those types of Tenebrionidæ described by Fabricius that are preserved in the Museums of Copenhagen and Kiel. The Banks Collection, now in the British Museum, is also rich in the types of this author, and a survey of these, together with Gebien's notes, goes far towards a revision of the Fabrician types of this family.

The species are taken in the order adopted in the most recent Catalogue (Gebien in Junk's '*Coleopterorum Catalogus*,' 1910–1911). Of most of them Fabricius states definitely that the types are in the Banks Collection, though in a few cases no such information is given; in such cases (with one exception) the descriptions are contained either in the *Syst. Ent.* (1775) or in *Spec. Ins.* i. (1781), in one or other of which works the Banksian species are described.

In some cases more than one specimen is placed above the name in question, and these frequently belong to different species. Where there is no evidence in favour of one or other being regarded as the type, and one of them belongs to the species usually known in collections by that name, I have taken it as being the type. Where no comment is added, the species may be taken as being correctly identified in collections, or, at any rate, as appearing with that name in the British Museum collection.

1. *Himatismus variegatus*, *Spec. Ins.* i. p. 323 (*Tenebrio*).  
Tropical Africa.

The description and figure given by Olivier (*Ent.* iii. 1795, 57, p. 14, pl. ii. fig. 16) are correct—indeed, the description refers directly to that of Fabricius. It is important to remember that Olivier had access to the Banks Collection while his work was in progress, so that his descriptions and figures of Fabrician species described from this collection are taken from the actual type-specimens.

Haag-Rutenberg, however, was mistaken in his identification of the species in his monographs of this genus, and his misidentifications are very generally disseminated in collections. *H. variegatus*, Haag (nec Fabr.), has recently been received from Dr. Péringuey as *H. dissepitus*, Pér.

2. *Zophosis testudinaria*, Spec. Ins. i. p. 326 (*Erodius*).  
S. Africa.

This is the insect generally known as *Z. muricata*, F. The above reference is not given in the Catalogues, where the name appears as *Z. testudinaria*, F. (Mant. Ins. i. 1787, p. 215), though this reference is, in fact, merely a quotation of the earlier description. The confusion of species originated with Solier (Ann. Soc. Ent. Fr. iii. 1834, p. 620), who was unable to accept the identity of *testudinaria*, Ol., with *testudinaria*, F., preferring to regard it as synonymous with *muricata*, F. But Olivier again merely follows Fabricius in his description, and figures the right insect; the type of *muricata*, F., is in Copenhagen, and has been found by Gebien to be an *Adesmia*.

The synonymy of this species is therefore

*Z. testudinaria*, F., Ol. = *muricata*, Sol., Deyr. (nec F.).

The Arabian species known to Solier as *testudinaria* I have not been able to identify with certainty; Deyrolle, in his later monograph (Ann. Soc. Ent. Fr. (4) vii. 1867, p. 168), follows Solier. The species may be known as *farinosa*, nom. nov., an unpublished name of Olivier's quoted as a synonym by Deyrolle:—

*Z. farinosa*, nom. nov. (Oliv., MS.) = *testudinaria*, Sol., Deyr. (nec F.).

3. *Pachycera buprestoides*, Spec. Ins. i. p. 323 (*Tenebrio*).  
S. Africa.

= *atra*, Herbst.

The locality noted by Fabricius is evidently erroneous. The species appears in the Catalogues as *Hejeter buprestoides*, with habitat Cape Verde, but on what authority is not clear.

4. *Stenocara serrata*, Spec. Ins. i. p. 317 (*Pimelia*). S. Africa.

5. *Stenocara porcata*, l. c. (*Pimelia*). S. Africa.

= *morbillosa*, F., var. *bonellii*, Sol. (Haag-Rut.).

The type of *morbillosa*, F., is stated to be in Mus. Dom. Helwig. From the description *Pimelia porcata*, Herbst, agrees with *porcata*, F.; but the *Adesmia porcata* of Solier and Allard, and now generally known in collections as

*A. porcata*, F., is a different insect. As Solier described this species in detail, the name may be retained as *Adesmia* (*Onymacris*) *porcata*, Sol. (nec F.).

6. *Eurychora ciliata*, Spec. Ins. i. p. 319 (*Pimelia*). S. Africa.

Two specimens are placed over this name, one being *E. ciliata*, F., of collections, the other *E. luctuosa*, Haag.

7. *Cryptochile echinata*, Spec. Ins. i. p. 317 (*Pimelia*). S. Africa.

8. *Cryptochile minuta*, Spec. Ins. i. p. 318 (*Pimelia*). S. Africa.

This species appears in the Catalogues as *C. minuta*, Ol.; but Olivier merely quotes Fabricius with the above reference.

9. *Cryptochile maculata*, Spec. Ins. i. p. 317 (*Pimelia*). S. Africa.

A specimen of another species (not identified by me) is associated with this.

10. *Psammodes striatus*, Syst. Ent. p. 251 (*Pimelia*). India.

The collection from which the type was taken is not stated, and the habitat given, "in Indiis," is presumably erroneous. The specimen is a ♀ belonging to the form *striatus* of Solier (sec. Haag), with the red elytral stripes fine and not very bright and the apical portion of the elytra finely granulate.

11. *Psammodes unicolor*, Spec. Ins. i. p. 316 (*Pimelia*). S. Africa.

= *Ps. timarchoides*, Haag.

Another instance of the latter author's misidentification of Fabrician species.

12. *Psammodes scaber*, Syst. Ent. p. 251 (*Pimelia*). S. Africa.

The species is represented by two specimens, one of which lacks the mouth-parts, which are presumably those found by Gebien in Kiel Museum (D. E. Z. 1906, p. 229). Gebien notes that the description in Syst. El. i. 1801, p. 130, is a copy of that in Ent. Syst. i. 1792, p. 101, but omits to note that the latter is a word-for-word copy of the reference quoted

above. All of them state that the type is in the Banks Collection.

The Kiel specimen is, as suspected by Gebien, incorrectly identified, and is one of the many instances of the misidentification by Fabricius of one of his own earlier-described species. *Pimelia scabra*, F., of Gebien's Catalogue must be synonymized with *Psammodes scaber*, F., of the same, leaving the name *valida*, Er., for the *Pimelia*. As before, Olivier's figure and description represent the Fabrician species.

13. *Trachynotus rugosus*, Spec. Ins. i. p. 315 (*Sepidium*). S. Africa.

14. *Trachynotus reticulatus*, l. c. (*Sepidium*). S. Africa.

This appears as an original description, with no reference to De Geer's work.

15. *Trachynotus vittatus*, Spec. Ins. i. p. 815 (*Sepidium*). S. Africa.

16. *Platyope lineata*, Spec. Ins. i. p. 319 (*Pimelia*). Siberia.

17. *Platynotus striatus*, Spec. Ins. i. p. 322 (*Blaps*). Coromandel.

18. *Pseudoblaps crenata*, l. c. (*Blaps*). Coromandel.

This is the *Platynotus rabourdinii*, Petit, of Dej. Cat.

19. *Melanimon tibiale*, Spec. Ins. i. p. 90 (*Opatrum*). Scania.

20. *Gonocephalum arenarium*, Syst. Ent. p. 76 (*Opatrum*). S. Africa.

The type belongs to the species identified by Miedel (Deutsch. Ent. Zeitschr. 1880, p. 139) as *crenatum*, F., of which the type has been examined by Gebien; Miedel's identification of *Op. arenarium*, F., with the Oriental *moluccanum*, Blanch., is, of course, equally erroneous.

21. *Achthosus sanguinipes*, Syst. Ent. p. 256 (*Tenebrio*). Australia.

= *laticornis*, Pasc.

This name does not appear in Gebien's Catalogue. The type is a ♀.

22. *Alphitobius lævigatus*, Spec. Ins. i. p. 90 (*Opatrum*).  
New Zealand.

=*piceus*, Ol., = *Microphyes rufipes*, MacL.

This name is also omitted from the Catalogues.

I have to thank Mr. H. J. Carter, of Sydney, for a specimen of *Microphyes rufipes*, MacL., compared with the type. Champion notes *Alphitobius piceus*, Ol., from Adelaide River (Trans. Ent. Soc. 1894, p. 379), and remarks that it is not included in Master's Catalogue.

23. *Saragus lævicollis*, Syst. Ent. p. 73 (*Silpha*). Australia.

This species is credited in the Catalogues to Olivier (Ent. ii. 1790, 11, p. 12); but this author again only follows the description of Fabricius. Confusion has also arisen as to the species designated. The type belongs to Macleay's Section II., with the elytra reticulate, and, from description, is probably identical with *S. reticulatus*, Haag. Two other specimens in the British Museum have their origin indicated as "Queensland." The Tasmanian and southern insect identified as this species by de Brême, Hope, and Macleay should therefore be known as *S. costatus*, Sol. (= *lævicollis*, de Br., Hope, MacL., nec F.).

24. *Taraxides lavigatus*, F., Spec. Ins. i. p. 323. Tropical Africa.

= *T. sinuatus*, F., = *T. confusus*, Westw.

There is some little doubt as to whether the insect purporting to be the type of this species was the one actually observed by Fabricius. Westwood did not think it was, and named it afresh (Trans. Zool. Soc. Lond. 1843, p. 223), but his reason for this opinion was mainly that it differed from the description in being larger than *T. molitor*, instead of smaller, as stated. This was apparently a slip, and is so noted by Olivier, whose figure also agrees sufficiently well with the Banksian insect to be recognizable (Oliv. Ent. iii. 1795, 57, p. 16, pl. ii. fig. 19 *bis*). This figure is incorrectly quoted in the text as fig. 19. The identity of *Tenebrio lævigatus*, F., with *T. lævigatus*, L., presumed by Olivier and Westwood, is apparently incorrect, and is nowhere suggested by Fabricius.

25. *Alobates morio*, Gen. Ins. 1776, p. 241 (*Helops*). N. America.

The collection from which the type is taken is not stated, but two specimens are placed over this name in the Banks Collection. One of these is a *Taraxides*, and need not be further considered. The other is a form of *Alobates barbata*, Knoch, and, what is very unusual, bears a locality-label, "Antigua." In this connection it may be noted that while both the Gen. Ins. (1776) and Ent. Syst. i. (1792) state "habitat in America boreali," in Syst. El. i. (1801) this is altered to "in Americæ meridionalis Insulis." Though there is an element of doubt as to the Banksian insect being the type of *Helops morio*, F., there is every probability that this is the case, or, at any rate, that it is conspecific, and this identification is supported by the description, which does not agree with the *Zophobas morio* of the Catalogues.

What, then, is *Zophobas morio* of our collections? The name is synonymized in the Catalogues with *nigritus*, Ol. (Ent. iii. 1795, 57, p. 5, pl. ii. fig. 26), but once more Olivier is referring to a species of Fabricius, *Helops nigrita*, F., Spec. Ins. i. p. 325. Fabricius repeats the description of this insect several times, as follows:—

1. *Tenebrio atratus*, Syst. Ent. 1775, p. 256. (S. America.)
2. *Helops nigrita*, Gen. Ins. 1776, p. 241. (S. America.)  
Synonymized with no. 1.
3.     "     "     Spec. Ins. i. 1781, p. 325. (S. America.)  
Synonymized with no. 1.
4.     "     "     Mant. Ins. 1787, p. 214. (No details.)
5.     "     "     Ent. Syst. i. 1792, p. 120. (S. America.)  
Copy of no. 3.
6.     "     "     Syst. El. i. 1801, p. 160. (Tranquebar.)  
Synonymized with no. 5.

This last description, though expressly synonymous with that of the Ent. Syst. i. 1792, evidently refers to a different insect, for, in addition to the new locality, we have the further details, "tibiæ anticæ in altero sexu ante apicem sinuatæ," not before mentioned. This must be the specimen seen by Gebien at Copenhagen and referred to *Pseudoblaps*, but it is clearly not the type of *Tenebrio atratus* (1775), = *Helops nigrita*, F. (1776), and for it the name *P. dispar*, Herbst (1797), will therefore stand.

The other five references apparently do relate to the species

originally described as *Tenebrio atratus* (1775). The type of this is stated to be in the British Museum, but I am unable to trace it. The evidence, however, is quite in accordance with the *Zophobas nigrinus*, Ol., having been correctly recognized, and this is clearly a synonym of "*Tenebrio*" *atratus*, F.

The three species about which the confusion has arisen may therefore be allocated as follows:—

*Pseudoblaps dispar*, Herbst.

=*atrata*, auct. (nec F.), =*nigrita*, auct. (nec F.).

*Zophobas atratus*, F.

=*nigrinus*, F., =*nigrinus*, Ol., =*morio*, auct. (nec F.).

*Alobates morio*, F., =*barbata*, Knoch.

26. *Priscoscelis serrata*, Syst. Ent. p. 255 (*Tenebrio*). Sierra Leone.

27. *Adelium porcatum*, Syst. Ent. p. 239 (*Carabus*). Australia.

28. *Hoplobrachium dentipes*, Spec. Ins. i. p. 326 (*Helops*). Coromandel.

=*ebeninus*, Walk. (*Helops*). Ceylon.

? = *asperipenne*, Fairm. Madagascar.

The name *dentipes*, F., is omitted from Gebien's Catalogue. Walker's type is in the British Museum, and I have seen that of Fairmaire in the Paris Museum; but, as I was unable at the time to make a direct comparison, the difference in locality makes me a little doubtful of this synonymy.

29. *Eupezus longipes*, Spec. Ins. i. p. 326 (*Helops*). Tropical Africa.

30. *Amarygmus morio*, Syst. Ent. p. 123 (*Erotylus*). Australia.

=*uniformis*, Blackbn., = *Helops æneus*, Oliv.

Mr. H. J. Carter has already published the results of my observations on these types of Australian Amarygmminæ, made at his request (Trans. Roy. Soc. S. Austral. xxxvii. 1913, p. 6).

Olivier, in transferring this group of insects from *Erotylus*



to *Helops*, changed the name of this species, in order to avoid clashing with *Helops morio*, F. (no. 25 above).

31. *Amarygmus bicolor*, Syst. Ent. p. 124 (*Erotylus*). Australia.

= *tardus*, Blackbn.

32. *Chalcopterus cupreus*, Syst. Ent. p. 123 (*Erotylus*). Australia.

= *venereus*, Gmel., = *setosus*, Blackbn.

A further study of this genus with the help of Mr. Carter's paper leads me to the opinion that *setosus*, Blackbn., = *cupreus*, F. I have only the single type-specimen of each, but there can, I think, be little doubt of their specific identity.

33. *Chalcopterus smaragdulus*, Syst. Ent. p. 123 (*Erotylus*). Australia.

= *cupricollis*, Hope, = *semiticus*, Pasc.

34. *Chalcopterus amethystinus*, Syst. Ent. p. 124 (*Erotylus*). Australia.

Again, a further study of this type leads me to modify the opinion originally communicated to Mr. Carter. I am unable to match the specimen with any other in the British Museum Collection. It most closely resembles *C. pulcher*, Blackbn. (though not identical with it), and is, in my opinion, not the *amethystinus* of Blackburn and Carter; nor is it *cyanipennis*, Hope.

Probably Fabricius was considering a series without detecting more than one species, for, though there is only one specimen in the Banks Collection, he says, "femoribus interdum rufis."

35. *Fæcilesthus fasciatus*, Spec. Ins. i. p. 158 (*Erotylus*). Hab.?

In Syst. El. ii. p. 6, the further details are given: "Habitat in America, Coll. D. Drury."

The Banks Collection contains also the types of the following species, which were erroneously placed in either *Tenebrio* or *Helops*:—

- Zabrus fossor*, Spec. Ins. i. p. 323 (*Tenebrio*). S. Africa.

= *gibbus*, F.

There is presumably an error in the locality given. The synonymy suggested later by Fabricius (Syst. El. i. p. 145) with *Chiroscelis digitata*, F., is certainly erroneous.

*Tribolioides ferrugineus*, Spec. Ins. i. p. 324 (*Tenebrio*).  
Tropical Africa.

Mr. C. O. Waterhouse has already dealt in detail with this specimen (Ann. & Mag. Nat. Hist. (6) xvii. 1896, p. 230; see also Blair, in Ent. Mo. Mag. 1913, p. 222).

*Lystronychus equestris*, Syst. Ent. p. 257 (*Helops*). Brazil.

*Lobopoda lurida*, Syst. Ent. p. 258 (*Helops*). Brazil.

The name does not appear in Borchmann's recent 'Catalogue of the Alleculidæ.' The species has a closely punctured thorax, approaching *L. puncticollis*, Champ. (Guatemala), though the eyes are scarcely so approximate.

*Tanychilus* (?) *rufipes*, Syst. Ent. p. 258 (*Helops*). Australia.

This name also does not appear in the Catalogues.

It appears to be a common Queensland and New South Wales species, but is not named in the British Museum Collection.

*Prionychus ater*, Syst. Ent. p. 258 (*Helops*). Lipsia.

The collection from which the type was described is not stated.

*Melandrya serrata*, Syst. Ent. p. 257 (*Helops*). England.

= *M. caraboides*, L.

Again, no collection is definitely specified as containing the type.

## LVII.—Notes on African Ungulates.

By ERNST SCHWARZ.

## I.—THE CLASSIFICATION OF THE DUIKERS.

IN the 'Book of Antelopes' all the Duikers were included in one genus, *Cephalophus*. Since then, however, the number of "species" has been enormously increased, and several subdivisions have been proposed. In 1899 O. Neumann\* pointed out that the steppe forms should be placed in a separate genus, *Sylvicapra*, Ogilby, their horns being more erect than in the other species, and the females usually lacking them. Pocock† has revived Gray's genus *Guevei* for the small species *maxwelli* and *melanorrhæus*, which have no inguinal glands. Finally, in 1907, Dr. Knottnerus-Meyer‡ has divided the genus, which he gives family rank, into two subfamilies with ten genera, most of which are very heterogeneous. A recent revision of the genus shows that four genera (*Sylvicapra*, *Cephalophus*, *Guevei*, and *Cephalophula*) should be recognized. Of these, *Sylvicapra* appears to be most closely allied to the *Cephalophus natalensis* group, and *Cephalophula* is certainly nearly related to *Cephalophus dorsalis*, as Thomas§ has shown; the presence of heel-tufts, the broad nasal chamber, the sagittal ridge, small preorbital fossæ in the skull, and the transverse body-stripes would, however, indicate that the separation of this form is justified. The remaining forms can be arranged in ten species, of which *ogilbyi* is the western representative of *callipygus* and *niger* of *spadix*. The relations of the other species amongst each other are not quite clear at present, but it has been thought advisable to publish the following list for the time being. A general revision of the local forms of most of the species pending, I have placed in each group all the names referable to it, which should be regarded as subspecies or synonyms of the species in question.

## I. SYLVICAPRA, Ogilby.

Type.

*Sylvicapra*, Ogilby, P. Z. S. 1836, p. 138..... *S. grimmia*.  
*Cephalophorus*, Gray, List Mamm. B. M. p. 162 (1843).. *S. grimmia*.

One species.

\* Sb. nat. Fr. p. 19 (1899).

† P. Z. S. 1910, ii. pp. 867-876.

‡ Arch. f. Naturg. lxxiii. vol. i. pp. 42-43 (1907).

§ P. Z. S. 1892, p. 425.

*Sylvicapra grimmia*, L.

Including :—

*Abyssinica*, *altifrons*, *altivallis*, *burchelli*, *caffa*, *campbelliæ*, *cana*, *coronata*, *deserti*, *flavescens*, *grimmia*, *hindei*, *irrorata*, *leucoprosopa*, *madoqua*, *mergens*, *nictitans*, *nyansæ*, *ocularis*, *pallidior*, *platous*, *platyotis*, *ptoox*, *roosevelti*, *shirensis*, *splendidula*.

## II. GUEVEI, Gray.

Type.

*Guevei*, Gray, Cat. Ung. B. M. p. 80 (1853) ..... *G. maxwelli*.

Two species.

1. *Guevei maxwelli*, H. Smith.

Including :—

*Frederici*, *maxwelli*, *philantomba*, *pygmæus*, *whitfieldi*.

2. *Guevei cærulæ*, H. Smith.

Including :—

*Æquatorialis*, *æquinotialis*, *anchietæ*, *bakeri*, *bicolor*, *cærulæ*, *caffer*, *congicus*, *defriesi*, *hecki*, *lugens*, *melanorrhæus*, *minutus*, *monticola*\*, *musculoides*, *nyasæ*, *perpusillus*, *schultzei*, *sundevalli*.

## III. CEPHALOPHUS, H. Smith.

Type.

|  |                          |
|--|--------------------------|
| <i>Cephalophus</i> , H. Smith, Griff. An. K. v. p. 344 (1827).                             | <i>C. silvicultrix</i> . |
| <i>Cephalolophus</i> , Wagner et auct. (emend.) .....                                      | <i>C. silvicultrix</i> . |
| <i>Grimmia</i> , Laurillard, Dict. Univ. d'H. N. i. p. 623 (1839) .....                    | <i>C. rufilatus</i> .    |
| <i>Philantomba</i> , Blyth, Cuvier's An. Kingd. p. 140 (1840).                             | †                        |
| <i>Terpone</i> , Gray, P. Z. S. 1871, p. 592 .....   | <i>C. silvicultrix</i> . |
| <i>Potamotragus</i> , Gray, Cat. Rum. B. M. p. 24 (1872) ..                                | <i>C. silvicultrix</i> . |
| <i>Cephalophia</i> , Knottnerus-Meyer, Arch. f. Naturg. lxxiii. vol. i. p. 44 (1907) ..... | †                        |
| <i>Cephalophilum</i> , Knottnerus-Meyer, l. c. p. 45 (1907) ..                             | <i>C. niger</i> .        |
| <i>Cephalophella</i> , Knottnerus-Meyer, l. c. p. 45 (1907) ..                             | <i>C. callipygus</i> .   |
| <i>Cephalophops</i> , Knottnerus-Meyer, l. c. p. 46 (1907) ..                              | <i>C. dorsalis</i> .     |

Ten species.

\* *Monticola*, auct., nec Thunberg.

† No species given as type; contains a great number of species, including *silvicultrix*, *mergens*, *philantomba*—therefore identical with the unrestricted *Cephalophus*.

‡ No species given as type; contains *ogilbyi* and *leucogaster*.

1. *Cephalophus natalensis*, A. Smith.

Including :—

*Amœnus, aureus, bradshawi, claudi, harveyi, natalensis, nigrifrons, robertsi, rubidus, vassei, walkeri* \*.2. *Cephalophus rufilatus*, Gray.

Including :—

*Cuvieri, rubidior, rufilatus*.3. *Cephalophus leucogaster*, Gray.4. *Cephalophus niger*, Gray.

Including :—

*Niger, phuto*.5. *Cephalophus spadix*, True.6. *Cephalophus silvicultrix*, Afzelius.

Including :—

*Coxi, ituriensis, longiceps, melanoprymnus, punctulatus, ruficrista, sclateri, silvicultrix, thomasi*.7. *Cephalophus jentinki*, Thomas.8. *Cephalophus ogilbyi*, Waterhouse.

Including :—

*Brookei, ogilbyi*.9. *Cephalophus callipygus*, Peters.

Including :—

*Callipygus, centralis, ignifer, johnstoni, leopoldi, weynsi*.10. *Cephalophus dorsalis*, Gray.

Including :—

*Badius, breviceps, castaneus, dorsalis, leucochilus, orientalis*.

## IV. CEPHALOPHULA, Knottnerus-Meyer.

Type.

*Cephalophula*, Knottnerus-Meyer, Arch. f. Naturg. lxxiii.vol. i. p. 46 ..... *C. doria*.

One species.

\* I am almost certain that *walkeri* is a subspecies of *natalensis*; it may be distinct from or merely a melanistic variety of the form called *bradshawi* by Mr. Wroughton.

*Cephalophula doria*, Ogilby.

Including :—

*Doria*, *zebra*.

In addition to the above forms, a species called *Cephalophus emini* has been described by Prof. Noack. The hairs, for samples of which I am indebted to Prof. Noack, are much thicker than in any species of this group, and most like those of *Ourebia*. It is, of course, quite impossible to give a definite opinion with regard to the status of this species without examination of the actual specimen.

## II.—A NEW BUFFALO FROM THE NEW KAMERUN BOUNDARY.

*Bubalus caffer houyi*, subsp. n.

*Type locality*. Pelle, near Gore, Eastern Logone River, New Kamerun Frontier.

*Type*. ♂ adult. Senckenberg Museum; original no. 65.

Allied to *B. c. brachyceros* from Lake Chad, but smaller, with much less expanded horns, the tips of which are much less erected.

Colour above variable, from reddish brown to deep black (in the type); under surface and throat brownish red to reddish brown.

*Skull* smaller than in *B. c. brachyceros*, face narrower, orbits slightly projecting; frontal scarcely convex at base of horns.

*Horns*: horn-cores slightly depending, less so than in *B. c. brachyceros*, but in strong contrast to the horizontal ones of *B. c. adamaue*; palm only slightly depending, with scarcely any boss at base, but with traces of transverse ridges, becoming narrower laterally; tip very long, stouter than in *brachyceros*, but less erected, although much more so than in *adamaue*, bent inward and slightly backward at the extreme end.

*Specimens examined*. Four skins, fourteen skulls, from the following localities between Gore, Upper Logone River, and Bate, River Uham, New Kamerun Boundary:—Gore; Pelle; River Nana Barya, between Bosum and Bate; Bate.

*Dimensions of type skull*. Basal length 426 mm.; palatal length 260; postorbital width 219; mastoid width 240; nasals  $193 \times 64$ ; horns, length along outer curve 750,

greatest width 730, distance of tips 390, breadth of palm at base 188.

Named for Dr. R. Houy, Surgeon and Naturalist to the German Boundary Expedition, whose untimely death by the hand of his native servant we have to deplore.

P.S.—When describing *Bubalus caffer adamaue* the dimensions of the type skull were omitted by mistake. They are given here:—

Basal length 411 mm. ; palatal length 250 ; postorbital width 205 ; mastoid width 213 ; nasals  $177 \times 63$  ; horns, length along outer curve 550, greatest width 525, distance of tips 280, breadth of palm at base 155.

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#### LVIII.—*Some Dragonflies and their Prey.*

By HERBERT CAMPION.

It is a well-known fact that Odonata, in all their stages, are highly predaceous creatures, and are veritable tyrants in the insect-world. Prey is seized by the nymphs with the extraordinary modification of the labium called the "mask." It is customary for imagines, with which we shall deal exclusively on the present occasion, to take their prey during flight, and it may be assumed that they capture the smaller insects upon which they feed with the aid alone of their powerful jaws. Larger prey, no doubt, is caught and held by the Dragonfly's spiny legs, the length and position of which are such as to enable their possessor to bring all of them simultaneously to the level of the mouth.

The capacity for destruction possessed by Dragonflies is enormous, and "Beutenmüller found that one of the large ones would eat forty house-flies inside of two hours, while a smaller one ate twenty-five in the same time" (Dr. L. O. Howard, 'The Insect Book,' 1902, p. 365). On the other hand, their power of resisting famine is considerable, and during dull weather, when they fly very rarely, if at all, they probably pass several days in succession without obtaining any food whatever. In those countries, therefore, where the sun shines without intermission for long periods at a time, the activity of Dragonflies must be much greater than in cloudy climates, and the consumption of other insects must increase in a corresponding degree.

The principal source of our knowledge of what Dragonflies

eat is direct observation in the field. Further information could probably be gained by the examination of the contents of the alimentary canal in newly-caught specimens. Another mode of enquiry has been suggested by Professor H. Maxwell Lefroy, who has written on Indian Dragonflies and their prey (*Journ. Bombay Soc.* xx. pp. 236-238, 1910). He says: "In the field one sees dragonflies sitting on a convenient plant or support and darting off every now and then on the chase. Below such a point, to which the same dragonflies come back constantly, one finds their excreta." A study of these excreta, undertaken by the same author, revealed the presence of remains of Orthoptera, Aculeate Hymenoptera, Lepidoptera, Coleoptera, Diptera, and Rhynchota.

In connection with the study of predaceous insects generally, Professor E. B. Poulton has published sixteen illustrations of the kind of prey selected by Dragonflies as food (*Trans. Ent. Soc. London*, 1906, pp. 398-401). The following records will serve to supplement those illustrations, and they are here presented in the same convenient form. The captors and prey from Nyasaland and British East Africa cited in Table I. (pp. 498-501) were obtained by Mr. S. A. Neave, while visiting those countries on behalf of the Imperial Bureau of Entomology. I am indebted to Mr. Guy A. K. Marshall, the Director of the Bureau, for his kindness in allowing me to study this material, as well as some other examples of a similar kind sent from Uganda by Dr. G. D. H. Carpenter (Sleeping Sickness Commission of the Royal Society). The cases collected in Essex and Surrey by my brother and myself have been already published in our annual reports upon British Dragonflies, but they are now brought together and incorporated with the original records from Africa. I have considered it advisable to separate the cases of cannibalism—if this term can be rightly employed when the captor and prey do not belong to one and the same species—from the instances in which Dragonflies have sought their food, more legitimately, among insects of other orders. My reason for doing so is that cases of this description, where one Dragonfly hunts another, are quite as germane to an enquiry as to what kind of animals prey upon Dragonflies as they are to the matter at present under consideration.

The whole of the African material mentioned in the following Tables has been presented to the British Museum (Natural History) by the Imperial Bureau of Entomology.

In view of the well-known fact that, both in collections and in the field, the males of most species of Dragonflies are



far more numerous than the females, it is worthy of remark that, out of the twenty-two individuals taken with prey in Tropical Africa by Dr. G. D. H. Carpenter, Mr. S. A. Neave, and Dr. Jas. J. Simpson, only six belong to the numerically superior sex. Indeed, in the case of one or two of the less common species, the present females are the first representatives of their sex which have been yet received either by the Imperial Bureau or by the British Museum.

It seems to be the fact that Dragonflies usually disable their victims by crushing or biting off the head, and this mode of attack is very well illustrated by F. Smith's specimens of *Æschna cyanea* and *Apis mellifera* (No. 21). They may also adopt an additional safeguard against escape by cutting off the wings of an insect which is particularly active or restless, and this removal of the wings has been the subject of actual observation. It is not quite clear, however, whether they habitually reject the wings or whether they sometimes make use of them as articles of food. From the following Tables we may see that detached wings of *Mycalesis* and *Danaïda* butterflies have been found in the clutches of Dragonflies (Nos. 18 and 25). It has been suggested to me that what may actually happen in such cases is this—that the Dragonfly seizes its prey by one wing alone, and that the prey subsequently escapes from such an insecure hold, leaving behind it a wing or portion of a wing. But I am inclined to think that wings are sometimes actually consumed, as well as the abdomen, and this view finds some support from the position in the Dragonfly's jaws of the butterfly fragment referred to in case No. 25. This fragment, which is still *in situ*, consists of a very small but perfectly recognizable portion of the right fore wing of *Danaïda chrysippus*. One of its edges represents the outer margin of the wing, but it is not this edge which is being grasped by the Dragonfly. Upon the assumption that the Dragonfly had torn this piece out of the butterfly's wing in an unsuccessful attempt at capture, we should have expected to find the Dragonfly holding it by the natural margin. As it is, it seems fairly safe to conclude that the *Orthetrum* was taken in the act of making a meal off the wing of the *Danaïda*.

The habits of the two suborders into which Dragonflies are divided are widely different in character. The larger and stronger species forming the bulk of the Anisoptera are built for vigorous and sustained flight, and they may be seen flitting to and fro in the summer sunshine, much as swallows do. The feebler Zygoptera, on the other hand,

Table I.—PARTICULARS OF SPECIMENS EXAMINED.

(a) *Dragonflies Preying upon Insects of other Orders.*

| Species of Odonata.                           | Species of Prey.  | Locality and Date.                                   | Observer.                                  |
|---|---|--|--|
| CALOPTERYGINÆ.                                |   |  |  |
| 1. <i>Libellago caligata</i> , Selys, ♂.      | { Tsetse-flies ( <i>Glossina</i> ), caught off collector's clothes. }                           | Bugalla Is., Lake Victoria, Uganda. 25th July, 1912. | { G. D. H. Carpenter. }                    |
| 2. <i>Libellago caligata</i> , Selys, ♂.      |   | The same locality. August, 1912.                     |  |
| AGRIONINÆ.                                    |   |  |  |
| 3. <i>Ischnura elegans</i> , Lind., ♂.        | The Leptocecid Caddis-fly <i>Trienodes bicolor</i> , Curt.<br>Identified by Mr. K. J. Morton.   | Byfleet, Surrey. 7th August, 1910.                   | F. W. & H. Campion. xlv. p. 239 (1911).    |
| 4. <i>Enallagma cyathigerum</i> , Charrp., ♂. | A Mosquito ( <i>Culex</i> sp.—too much damaged for further identification).                     | Epping Forest. 12th Sept., 1909.                     | F. W. & H. Campion. xlii. p. 295 (1909).   |
| 5. <i>Enallagma cyathigerum</i> , Charrp., ♂. | The Tortricid moth <i>Tortrix viridana</i> , L.   | Black Pond, Surrey. 18th June, 1911.                 | { F. W. & H. Campion. }                    |
| 6. <i>Enallagma cyathigerum</i> , Charrp., ♂. | The Pyralid moth <i>Scoparia ambigua</i> , Tr.<br>Identified by Mr. R. South.                   | Black Pond, Surrey. 20th June, 1911.                 |  |
| 7. <i>Agriion puella</i> , L., ♂.             | The Linnobiid fly <i>Erioptera flavescens</i> , Mg.<br>Identified by Mr. E. E. Austen.          | Epping Forest. 7th July, 1907.                       | F. W. & H. Campion. xl. p. 275 (1907).     |
| 8. <i>Agriion puella</i> , L., ♂.             | The Tortricid Moth <i>Tortrix viridana</i> , L.<br>Identification confirmed by Mr. R. South.    | Epping Forest. 28th June, 1908.                      | F. W. & H. Campion. xlii. p. 8 (1909).     |
| 9. <i>Agriion puella</i> , L., ♂.             | The Tortricid Moth <i>Tortrix viridana</i> , L.   | Epping Forest. 18th July, 1909.                      | F. W. & H. Campion. xlii. p. 294 (1909).   |
| 10. <i>Pyrrhosoma nymphula</i> , Sulz., ♂.    | A Tortricid Moth, apparently <i>Grapholitha succedana</i> , Fröl.                               | Epping Forest. 5th June, 1904.                       | F. W. & H. Campion. xxxvii. p. 300 (1904). |
| 11. <i>Ceragriion glabrum</i> , Burm., ♂.     | A Pyralid Moth, too much damaged for further identification.                                    |  |  |
| 12. <i>Ceragriion glabrum</i> , Burm., ♀.     | A Geometrid Moth belonging to the genus <i>Craspedia</i> , probably <i>C. minorata</i> , Boisd. |  |  |
|   |   | { Mt. Mlanje, Nyasaland. 8th Oct., 1913. }           | S. A. Neave.                               |

|  |  |  |  |                     |
|--|--|--|--|---------------------|
| 13. <i>Ceriatrigon glabrum</i> , Burm., ♀.   |  | A Pyralid Moth, not in sufficiently good condition for exact determination.  | Kola Valley, E. of Mt. Chipirone, Portuguese East Africa. 23rd November, 1913. | S. A. Neave.        |
| GOMPHINÆ.  |  |  |  |                     |
| 14. <i>Ictinus ferox</i> , Ramb., ♂.   |  | The Bee <i>Apis mellifera unicolor</i> , var. <i>adansoni</i> , Latr., ♀.  | Bugalla Is., Lake Victoria, Uganda. October, 1912.                             | G. D. H. Carpenter. |
| 15. <i>Ictinus ferox</i> , Ramb., ♀.   |  | The Bee <i>Apis mellifera unicolor</i> , var. <i>adansoni</i> , Latr., ♀.  | Bugalla Is., Lake Victoria, Uganda. August, 1912.                              | G. D. H. Carpenter. |
| 16. <i>Ictinus ferox</i> , Ramb., ♀.   |  | The Pompilid Wasp <i>Pompilus diversus</i> , Dabib., ♀.<br>Identification confirmed by Mr. G. Meade-Waldo.   |  |                     |
| 17. <i>Ictinus ferox</i> , Ramb., ♀.   |  | A Reduviid Bug, received in poor condition, but apparently belonging to the genus <i>Harpaactor</i> .  | Bugalla Is., Uganda. September, 1912.  | G. D. H. Carpenter. |
| 18. <i>Notogomphus rucppeli</i> , Selys, forma, ♀.   |  | The Satyrid Butterfly <i>Mycalesis miriam</i> , Fabr., ♂.<br>Identified by Mr. N. D. Riley.<br>Right hind wing only, which remained in the grasp of the captor's jaws until the Dragonfly was relaxed for setting. | Yala River, southern edge of Kakumega Forest, Brit. E. Africa. 22nd May, 1911. | S. A. Neave.        |
| 19. <i>Notogomphus rucppeli</i> , Selys, forma, ♀.<br>Identified by Mons. René Martin.   |  | The Pierid Butterfly <i>Belenois severina</i> , Cram., ♂.<br>Identified by Mr. N. D. Riley.  | Nandi Plateau, Brit. E. Africa. 4th June, 1911.                                | S. A. Neave.        |
| 20. <i>Notogomphus rucppeli</i> , Selys, forma, ♀.<br>Identified by Mons. René Martin.   |  | The Nymphalid Butterfly <i>Acraea terpsichore</i> , L., ♂.<br>Identified by Mr. N. D. Riley.   | Upper Nzoia R., Brit. E. Africa. 5th June, 1911.                               | S. A. Neave.        |
| 21. <i>Æschna cyanea</i> , Müll., ♀.<br>Specimens in the British Museum (Nat. Hist.):<br>"This insect <i>Æschna cyanea</i> was observed capturing Hive-bees—and devouring them—when caught it had one in its jaws, which it retained when killed with chloroform."—Note by F. Smith. |  | The Hive-bee ( <i>Apis mellifera</i> , L.), ♀.<br>Identification confirmed by Mr. G. Meade-Waldo.  | Locality not recorded.   | F. Smith.           |

Table I. (*continued*).

| Species of Odonata.  | Species of Prey.   | Locality and Date.   | Observer.   |
|--|--|--|---|
| 22. <i>Anax imperator</i> <i>imperator</i> , Leach,<br>♂.                  | The Tortricid Moth <i>Tortrix viridana</i> ,<br>L.<br>The Dragonfly was seen to dash<br>through a swarm of the Moths<br>and to fly off with one of them. | Epping Forest, 28th June, 1903.                                    | F. W. & H. Campion.<br>xlii. p. 9 (1909).<br>Entom. |
| LIBELLULINE.   |  |  |   |
| 23. <i>Orthetrum trinacria</i> , Selys, ♀.<br>Identified by Dr. F. Ris.    | The Nymphalid Butterfly <i>Precis hiera</i><br><i>cebreus</i> , Trim., ♀.<br>Identified by Mr. N. D. Riley.  | L. Mpeketoni, nr. Kipini, Brit. E.<br>Africa. 4th-5th March, 1911. | S. A. Neave.  |
| 24. <i>Orthetrum trinacria</i> , Selys, ♀.                                 | The Pierid Butterfly <i>Catopsilia flo-</i><br><i>rella</i> , Fabr.<br>Head missing.   | Mwanza R., Shire Valley, Nyasaland.<br>28th July, 1913.            | S. A. Neave.  |
| 25. <i>Orthetrum brachiale</i> , P. de B., ♂.<br>Identified by Dr. F. Ris. | A fragment of the right fore wing of<br>the Nymphalid Butterfly <i>Danaida</i><br><i>chrysippus</i> , L.<br>Identified by Mr. N. D. Riley.               | Anyinam, Gold Coast. 8th January,<br>1913.                         | Jas. J. Simpson.                                    |
| 26. <i>Orthetrum brachiale</i> , P. de B., ♀.                              | The Tabanid Fly <i>Hematopota longi</i> ,<br>Ric.<br>Identified by Mr. E. E. Austen.<br>Head badly crushed.  | Mlanje, Nyasaland. 13th January,<br>1913.                          | S. A. Neave.  |
| 27. <i>Orthetrum brachiale</i> , P. de B., ♀.                              | The Lymantrid Moth <i>Euproctis pul-</i><br><i>vida</i> , Kirby.   | Mlanje, Nyasaland. 21st January,<br>1913.                          | S. A. Neave.  |
| 28. <i>Orthetrum stenmale</i> <i>capense</i> ,<br>Caly., ♀.                | The Tabanid Fly <i>Hematopota longi</i> ,<br>Ric.<br>Identified by Mr. E. E. Austen.<br>Head and one wing missing.                                       | Mt. Mlanje, Nyasaland. 3rd January,<br>1913.                       | S. A. Neave.  |

|  |  |   |  |
|--|--|---|--|
| 29. <i>Orthetrum farinosum</i> , Först., ♀<br>(mature).<br>Identified by Dr. F. Ris.         | The Tsetse-fly <i>Glossina palpalis</i> , R. D.<br>Caught and eaten by captor. | Damba I., Lake Victoria, Uganda.<br>October, 1911.  | G. D. H. Carpenter.                                |
| 30. <i>Orthetrum farinosum</i> , Först., ♀<br>(rather teneral).<br>Identified by Dr. F. Ris. | The Tsetse-fly <i>Glossina palpalis</i> , R. D.<br>Caught and eaten by captor. |   |  |
| 31. <i>Brachythemis leucosticta</i> , Burm., ♂.  | The Tsetse-fly <i>Glossina palpalis</i> , R. D.,<br>♂.                         | Bugalla I., Lake Victoria, Uganda.<br>August, 1912. | G. D. H. Carpenter.                                |
| 32. <i>Brachythemis leucosticta</i> , Burm., ♀.  | The Tsetse-fly <i>Glossina palpalis</i> , R. D.,<br>♂.                         |   |  |
| 33. <i>Sympetrum striolatum</i> , Charp., ♂.   | A Muscid Fly (too fragmentary for<br>exact determination).                     | Epping Forest. 5th September, 1909.                 | F. W. & H. Campion. Entom.<br>xlii. p. 295 (1909). |

(b) *Dragonflies Preying upon other Dragonflies.*

| Species of Odonata.  | Species of Prey.   | Locality and Date.                                   | Observer.           |
|--|--|--|---------------------|
| ÆSCHINE.<br>34. <i>Anax imperator mauricianus</i> ,<br>Ramb., ♂.<br>Specimens in the British<br>Museum (Nat. Hist.). | <i>Trithemis annulata</i> , P. de B., ♂.   | Aden. 23rd March, 1895.                              | J. W. Yerbury.      |
| LIBELLULINÆ.<br>35. <i>Orthetrum trinaeria</i> , Selys, ♂.   | <i>Brachythemis leucosticta</i> , Burm., ♂.  | Bugalla Is., Lake Victoria, Uganda.<br>June, 1912.   | G. D. H. Carpenter. |
| 36. <i>Orthetrum trinaeria</i> , Selys, ♂.   | <i>Chalcostephia coronata flavifrons</i> ,<br>Kirby.<br>Identification confirmed by<br>Dr. F. Ris. | Bugalla Is., Lake Victoria, Uganda.<br>August, 1912. | G. D. H. Carpenter. |

Table II.—SUMMARY OF PREY.

| Prey.        |                            | Captors.       |            |           |            |              |
|--------------|----------------------------|----------------|------------|-----------|------------|--------------|
| Order.       | Family.                    | CALOPTERYGINE. | AGRIONINE. | GOMPHINE. | ÆSCHININE. | LIBELLULINE. |
| ODONATA.     | Libellulidæ—Libellulinae . | ...            | ...        | ...       | 1          | 2            |
| RHYNCHOTA.   | Reduviidæ .....            | ...            | ...        | 1         | ...        | ...          |
| HYMENOPTERA. | Pompilidæ .....            | ...            | ...        | 1         | ...        | ...          |
|              | Apidæ .....                | ...            | ...        | 2         | 1          | ...          |
| TRICHOPTERA. | Leptoceridæ .....          | ...            | 1          | ...       | ...        | ...          |
| LEPIDOPTERA. | Tortricidæ.....            | ...            | 4          | ...       | 1          | ...          |
|              | Pyrалidæ .....             | ...            | 3          | ...       | ...        | ...          |
|              | Geometridæ .....           | ...            | 1          | ...       | ...        | ...          |
|              | Lymantriidæ.....           | ...            | ...        | ...       | ...        | 1            |
|              | Pieridæ .....              | ...            | ...        | 1         | ...        | 1            |
|              | Satyridæ .....             | ...            | ...        | 1         | ...        | ...          |
|              | Nymphalidæ.....            | ...            | ...        | 1         | ...        | 2            |
| DIPTERA.     | Culicidæ .....             | ...            | 1          | ...       | ...        | ...          |
|              | Tabanidæ .....             | ...            | ...        | ...       | ...        | 2            |
|              | Muscidæ .....              | 2              | ...        | ...       | ...        | 5            |
|              | Limnobiidæ .....           | ...            | 1          | ...       | ...        | ...          |
| Totals ..... |                            | 2              | 11         | 7         | 3          | 13           |

spend their lives resting on water-plants and low bushes, or in taking short flights over the surface of the water. It is possible, therefore, that this great difference in the mode of life may be accompanied by a difference in feeding-habits.

I cannot discover that particular species of Dragonflies show any marked preference for particular species of prey. *Tortrix viridana* appears four times in the British records cited above, but only twice in connection with the same species of Dragonfly, and only three times in association with members of the same family; moreover, this pretty little moth occurs about oak-trees in swarms during June and July. Six records of tsetse-flies from Uganda are distributed equally among three not uncommon species of Odonata,

falling into two different families, but in this case Dr. Carpenter, who made the observations, was paying special attention to the bionomics of the dreaded carrier of sleeping sickness. The same entomologist obtained two specimens of *Ictinus ferox* preying upon the same African honey-bee; but he also found that Dragonfly feeding upon other Hymenoptera as well as Rhynchota. Again, the two specimens of the blood-sucking fly *Hæmatopota longa*, sent home from Nyasaland by Mr. Neave, were being fed upon by different species of *Orthetrum*.

So far as our enquiry has proceeded, it would appear that Odonata, whether considered by species or as a group, are omnivorous feeders among other flying insects\*, and I am not aware that any evidence is forthcoming to show that apterous or larval insects contribute in any way to a Dragonfly's diet. Even Danaine and Acræine butterflies, which are known to be distasteful to many insect-feeding vertebrates, are not rejected by the voracious Dragonfly. *Danaïda chrysippus* may be taken as a typical example of a butterfly specially protected against the attacks of vertebrate enemies; but it does not enjoy the same immunity from the assaults of Odonata. In addition to Dr. Simpson's record (No. 25), Mr. Guy Marshall observed in Natal a very large red Dragonfly (now recognized by him as *Anax speratus*, Hagen) devouring an imago of the same species of butterfly (Trans. Ent. Soc. London, 1902, p. 329). We have also seen that honey-bees are sometimes hunted down for food (see cases Nos. 14, 15, and 21). Indeed, the 'Field' for 21st March, 1908 (p. 486), mentions the complaint of a bee-keeper in Australia against "the dragon-fly, which is a greater pest than any of the birds, and sucks bees dry by the dozen in one summer day." Moreover, toll is taken of certain other predaceous insects, such as Pompilid Hymenoptera and Reduviid bugs; but, although Asilid flies not infrequently attack Dragonflies, I cannot ascertain that Odonata ever attack Asilidæ.

There is necessarily some correspondence between the size of the captor and the size of the prey. All the large-bodied Hymenoptera which we have had under review have fallen victims to Dragonflies of the family *Æschnidæ*, which includes the largest members of the order, while the small

\* Mr. E. B. Williamson says that "Mr. F. S. Webster has observed *Libellula auripennis* feeding on fresh crocodile flesh" (Indiana Geol. Reports, xxiv. p. 235, 1899).

and comparatively feeble Agrionidæ feed largely upon such moths and Diptera as can be easily overpowered by them. But, apart from this matter, the amount of information which has so far been accumulated is hardly sufficient to enable us to determine whether much discrimination is exercised by Odonata in the selection of living things as articles of food.

58 Ranelagh Road, Ealing, W.

20th March, 1914.

LIX.—*Descriptions and Records of Bees*.—LIX.

By T. D. A. COCKERELL, University of Colorado.

*Halictus hedleyi*, Cockerell, var. *a*.

♂.—Hind tibiæ broadly dusky in middle; second abdominal segment red, with a very broad dusky apical shade, third segment red at sides of base, otherwise black, fourth black.

*Hab.* "Cheltenham, Victoria" (*French*, Froggatt coll. 184).

This differs from *H. hedleyi* only in the reduction of the red colour, and is presumably no more than an individual variation. Toward the end of the original description of *H. hedleyi*, venter is misprinted "vertex."

*Halictus vitripennis*, Smith, var. *a*.

♀.—First abdominal segment red, with a transverse dark mark.

*Hab.* Purnong (*S. W. Fulton*, Nat. Mus. Vict. 146).

*Halictus dampieri*, Cockerell.

♂.—Brisbane, May 13, 1912 (*H. Hackeri*, Queensl. Mus. 64).

*Halictus punctatus*, Smith.

Croydon (*S. W. Fulton*, Nat. Mus. Victoria, 178, 181, 179, 239, 240, 243).

*Halictus erythrurus*, sp. n. (*sphecodoides*, subsp. ?).

♀.—Length a little less than 5 mm.

Pubescence scanty, dull white; head ordinary, black, the



convex supraclypeal area faintly greenish; apical half of mandibles red; flagellum rather dull red beneath; front dullish, very minutely sculptured; thorax black, with the mesothorax and scutellum dark olive-green; mesothorax dullish, finely and quite closely punctured, granulated between the punctures; disc of scutellum, except in middle, shining and very sparsely punctured; area of metathorax large, rounded behind, its surface covered with a very fine reticulation. Legs black, with pale hair, the knees and small joints of tarsi more or less ferruginous; hind spur with a very large subbasal tooth; tegulæ pale rufo-testaceous, darkened at base. Wings clear hyaline, stigma and nervures testaceous; outer nervures much weakened, as in *Chloralictus*. Abdomen broad, without hair-bands, bright chestnut-red; the first segment, except the broad apical margin, extending more or less down sides, black. The anterior tibiæ may be red in front, except apically.

Variety *a*.—Rather smaller; mesothorax more shining, dark bluish green.

*Hab.* Croydon, Australia (*S. W. Fulton*, Nat. Mus. Vict. 177, 182); var. *a*, same data (180).

Closely related to *H. sphecodoides*, Smith, and perhaps only a subspecies, but distinguished by the abdomen being all red except at base, the stigma paler, the flagellum lighter beneath. It appears to be the dry-country representative of *H. sphecodoides*.

It is possible, judging from Smith's description, that the original series of *sphecodoides* included the present species, but the type was restricted in Ann. & Mag. Nat. Hist., Sept. 1904, to the form with the apical part of the abdomen dark.

*Halictus caloundrensis*, sp. n.

♀.—Length 6 mm.

Robust, with scanty white hair; abdomen without hair-bands or spots; head ordinary, dark bluish green, shining; mandibles dark reddish apically; clypeus partly very bright green, well punctured; a fine sharp keel between the antennæ; front finely longitudinally striate, the striæ before middle ocellus longitudinal (transverse in *transvolans*); flagellum dark, obscure reddish apically; mesothorax very brilliant yellowish green, with curious transverse wave-like plicæ, directed obliquely, so as to meet at an angle in middle line; scutellum peacock-green, the disc smooth and brilliantly shining; area of metathorax with longitudinal plicæ or

ridges, joined at intervals by little transverse ones, so as to produce a cancellated effect; at sides the plicæ run over the edge of the area proper. Legs black, the middle and hind femora dark greenish; hind femora strongly concave beneath; hind spur with three or four short teeth; tegulæ rufous, hyaline in front. Wings clear hyaline; stigma dark brown, nervures sepia; outer r.n. and t.-c. evanescent; first r.n. meeting second t.-c. Abdomen broad, shining steel-blue, with slight purple tints; venter with a curled white floccus.

*Hab.* Caloundra, Queensland, Oct. 30, 1912 (*H. Hacker*, Queensl. Mus. 83).

*H. caloundrensis* is of the immediate group of *H. behri*, *transvolans*, and *flindersi*, but is easily separated by the remarkable sculpture of the mesothorax.

*Halictus urbanus*, Smith.

Stradbroke Island, Oct. 2, 1911 (*Hacker*, Queensl. Mus. 51).

*Halictus lanarius*, Smith.

Females (*lanarius*, Sm.): Brisbane, Jan. 17, 1912 (*Hacker*; Queensl. Mus. 16); Oakleigh (*Hill*; Nat. Mus. Vict. 69).

Males (*lanuginosus*, Sm.): Whittlesea (*J. A. Kershaw*; Nat. Mus. Vict. 97); Tambourine Mtn., Oct. 27 (*Hacker*; Queensl. Mus. 77); Windsor, Victoria (*French*; Froggatt, 82); Sydney, N.S.W. (*Froggatt*, 117); Timboon (*J. A. Kershaw*; Nat. Mus. Vict. 75).

*Halictus hæmatostoma*, sp. n.

♂.—Length about  $4\frac{3}{4}$  mm.

Robust, with dull white hair; head and thorax black, with labrum, mandibles (except base), and lower margin of clypeus bright ferruginous; mesothorax and scutellum shining dark bluish green; scape black, flagellum bright apricot-colour, slightly dusky above; mesothorax very distinctly but not very densely punctured, the punctures small; middle of scutellum distinctly punctured; area of metathorax small and short, irregularly wrinkled; knees and tarsi bright ferruginous; tegulæ dark reddish. Wings clear, nervures and stigma very light testaceous; outer t.-c. and r.n. evanescent. Abdomen piceous, with the hind margins of the segments pallid; a rather strong constriction between first and second segments. This male has exactly the build of a normal female, with robust body and short antennæ.

*Hab.* "Windsor, Victoria" (*French* ; Froggatt coll. 196).

This is evidently related to *H. inclinans*, Smith, also found at Windsor, but cannot be its male, the mesothorax being much more shiny and sparsely punctured. In both, the first r. n. enters the third s.m. near the basal corner.

*Halictus holochlorus*, sp. n.

♀.—Length a little over 6 mm.

Green, with dull white hair; head broad, rather dark yellowish green; supraclypeal area shining, rather bluish green, contrasting with upper part of clypeus, which is pale golden green; lower part of clypeus black; mandibles red, except at base; front very finely longitudinally striate; scape slender, black, red at extreme base; flagellum ferruginous beneath, very dark reddish above; face and front rather conspicuously though thinly hairy; mesothorax peacock-green, quite bright, but granular and with dull surface, microscopically tessellate, with sparse yellow punctures, hardly visible with a lens; scutellum more shining; area of metathorax large, with fine longitudinal ridges, connected at intervals by cross-ridges, producing a minutely cancellate effect; upper part of pleura shining green. Legs black or piceous; knees and small joints of tarsi more or less ferruginous; tegulæ ferruginous. Wings greyish hyaline, nervures and stigma light reddish testaceous; first r. n. meeting second t.-c.; outer r. n. and t.-c. weakened. Abdomen shining dark brassy greenish; apical margins of segments pale and translucent, covering the dark ferruginous bases of the succeeding ones; no distinct curled ventral scopa.

*Hab.* "Cheltenham, Victoria" (*French* ; Froggatt coll. 179).

This is readily known from *H. urbanus* by the light reddish stigma and green abdomen. From *H. floralis* it is known by the larger size and other characters.

*Halictus hackeriellus*, sp. n.

♂.—Length about 5 mm.

Like *H. kesteveni*, differing as follows:—Head yellowish green; mesothorax dull brassy, scutellum the same colour, but shining, contrasting with the bluish-green postscutellum and metathorax (but the area is not at all blue, as it is in *kesteveni*); fourth antennal joint conspicuously longer than broad (not longer than broad in *kesteveni*); front longitudinally striate. As in *kesteveni*, the first r. n. enters base of third s.m.

This is easily known from the male of *H. dampieri* by the smaller size, much shorter antennæ, and absence of a yellow band on clypeus.

*Hab.* Brisbane, May 13, 1912 (*H. Hacker*, Queensl. Mus. 65).

*Halictus bicingulatus*, Smith.

♀.—Sydney, N.S.W., Nov. 29 and Dec. 1, 1910 (*Froggatt*, 131, 119); Kenthurst, N.S.W., Feb. 1904 (*Gallard*; *Froggatt* coll. 126); Brisbane, Nov. 5 and 25, 1905 (*Froggatt* coll. 166, 167).

The male from Kelvin Grove, Brisbane, Nov. 27, 1911 (*Hacker*; Queensl. Mus. 46), is like *H. leai*, except that the abdomen is black, without bands or spots.

*Halictus peraustralis*, Cockerell.

Sydney, N.S.W., Dec. 1, 1910 (*Froggatt*, 113, 130); Stradbroke I. (*Hacker*, Queensl. Mus. 53).

*Halictus tertius*, Dalla Torre (*rufipes*, Sm.).

Croydon (*S. W. Fulton*, Nat. Mus. Victoria, 267, 268).

With the above material before me I am able to revise the *H. bicingulatus* group, and separate the females of the species as follows:—

- |  |    |   |
|--|----|---|
| Wings reddish, costal region not blackened;<br>disc of mesothorax finely and densely, but<br>distinctly punctured .....                          | 1. |   |
| Wings with the costal region conspicuously<br>suffused with blackish; mesothorax differently<br>sculptured.....                                  | 2. |   |
| 1. Hind margins of abdominal segments hardly or<br>not reddened .....  |    | <i>bicingulatus</i> , Smith.  |
| Hind margins of abdominal segments broadly<br>ferruginous .....  |    | <i>bicingulatus</i> , var. <i>leai</i><br>[ <i>(H. leai</i> , Ckll.). |
| 2. Disc of mesothorax glaucous, shining, sparsely<br>punctured; scape and lower margin of<br>clypeus dark or obscure reddish .....               |    | <i>tertius</i> , D. T.  |
| Disc of mesothorax dull, appearing minutely<br>granular under a lens; scape bright ferru-<br>ginous, lower margin of clypeus broadly<br>red..... |    | <i>peraustralis</i> , Ckll.   |

*H. peraustralis* has a patch of very bright orange tomentum on the postscutellum, which is absent from *H. tertius*. In 1904 I placed *tertius* as a synonym of *bicingulatus*, having compared specimens in the British Museum. Smith evidently confused the species of this group, the types of the

two he described not being in the British Museum. A specimen of supposed *bicingulatus* before me, from Smith's collection, is *peraustralis*. Smith's descriptions are, however, sufficiently exact, and I have no doubt of my identifications. When I described *H. leai* as a distinct species I was misled by the supposed *bicingulatus* from Smith's collection. Male *H. leai* shows the broad red plate, characteristic of the *hedleyi* and *tasmaniae* group, on the apex of abdomen. A male *leai* was taken at Croydon by S. W. Fulton (Nat. Mus. Vict. 156).

*Halictus griseovittatus*, sp. n.

♀.—Length about  $7\frac{1}{2}$  mm.

Black, robust, with dull white hair; tarsi reddish at apex, sometimes legs dark reddish; mandibles very obscurely reddish subapically; flagellum black or distinctly reddened apically; head broad; clypeus and supraclypeal area brilliantly shining, with large punctures; sides of face glistening, but middle and upper part of front perfectly dull, with exceedingly minute sculpture; a raised line running downward from middle ocellus; mesothorax shining, but strongly and quite closely punctured; scutellum with minute irregular punctures; area of metathorax semilunar, very finely wrinkled except near the margin, which is only moderately shining; sides of truncation not sharp or angular. Legs with white hair, very pale yellowish or fulvous on inner side of tarsi; hind spur with a single stout oblique tooth a little before the middle, and beyond this a very long low lamina or keel; tegulae piceous. Wings greyish hyaline, stigma dark rufo-piceous, nervures sepia; outer t.-c. and r. n. much weakened; first r. n. entering apical corner of second s.m. or meeting second t.-c. Abdomen shining, very minutely punctured; bases of segments with bands of pale greyish tomentum, broad and entire on third and fourth, mainly at sides on second; caudal rima pale greyish or brownish; venter with white hair, but no curled scopa.

*Hab.* Brisbane, Queensland; the type from Kelvin Grove, Jan. 15, 1912 (*H. Hacker*; Queensl. Mus. 27); others from Sunnybank, Sept. 12, 1911, and Logan Road, Sept. 18, 1911 (*Hacker*; Queensl. Mus. 4, 26); also three from Mackay, Queensland, March and April 1900 (*Turner*, 1079).

A distinct species, rather like a small edition of *H. representans*, but with quite different metathorax.

*Halictus instabilis*, sp. n.

♀.—Length about 8 mm.

Black, robust, with greyish-white hair, mixed with fuscous on vertex, mesothorax, and scutellum; mandibles very faintly reddish subapically; clypeus shining, with irregular, not very large punctures, and no median depression; sides of front glistening, but middle broadly dull black, excessively closely punctured; flagellum dark; anterior angles of prothorax rather prominent; mesothorax shining, with very fine but distinct punctures; scutellum broad and flattened, very minutely punctured; area of metathorax rather short, well defined, finely plicate, with a band of subbasal fine connecting ridges; in the whole middle area the plicæ are very fine and irregular, and the surface between them is minutely pitted; posterior truncation not sharply defined at sides; pleura very hairy. Legs piceous, with glistening light hair, the hind tibiæ with a band of greyish-fuscous hair on outer side; hind spur like that of *H. griseovittatus*; tegulæ piceous, with a large rufous spot. Wings dusky, greyish, stigma and nervures dull reddish, second s.m. higher than broad, first r.n. meeting second t.-c. Abdomen broad, shining, very finely punctured, bases of segments with greyish-white tomentum as in *H. griseovittatus*, but the bands have a slightly ochreous tint.

*Hab.* Croydon, Victoria (*Miss A. M. Fulton*; Nat. Mus. Vict. 77).

Variety *a*.

Stigma clearer red; second s.m. very broad, broader below than high; wings slightly reddish; area of metathorax longer.

*Hab.* "Windsor, Victoria" (*French*; Froggatt coll. 191).

Variety *b*.

Wings practically as in variety *a*, with broad second submarginal cell; postscutellum longer, subangulate behind; area of metathorax sharply defined, with stronger plicæ.

*Hab.* Victoria, Sept. 1901 (*C. F.*; Turner coll.).

Closely related to *H. griseovittatus*, but larger, with the bands on the abdomen differently coloured. Possibly variety *b* is a distinct species, but I hesitate to separate it, especially since var. *a* is intermediate between it and the type.

*Halictus repræsentans*, Smith.

Bacchus Marsh, Nov. 5 (*F. L. Bellinghurst*; Nat. Mus. Vict.); Emerald, Victoria, Nov. 19, 1903 (*J. A. Kershaw*; Nat. Mus. Vict.).

*Halictus orbatus*, Smith.

Fern Tree Gully (*R. F. Spry*; Nat. Mus. Vict. 252); Victoria, Sept. 1901 (*C. F.*; Turner coll.).

I cannot quite clearly separate *H. convexus*, Smith, from this, but actual comparison of types would, perhaps, show good characters.

*Halictus sturti*, Cockerell.

Mackay, March 1900 (*Turner*).

*Halictus cyclognathus*, sp. n.

♂.—Length not quite  $4\frac{1}{2}$  mm.

Black, with scanty greyish-white hair; head very large and broad; cheeks broad and flattened, angled behind; mandibles long, strongly curved, cream-coloured, red apically; clypeus with an apical cream-coloured band, not approaching orbits; supraclypeal area shining; front dullish, somewhat shining; antennæ rather long, black; mesothorax and scutellum shining, with sparse minute punctures; area of metathorax rugose and opaque, with a shining rim; mesopleura shining; anterior tibiæ ferruginous, with a large dark patch, middle tibiæ red at extreme apex and base; tarsi ferruginous, the hind ones dusky; tegulæ reddish. Wings clear, brilliantly iridescent, nervures and stigma ferruginous; first r. n. joining second s. m. a short distance before apex; outer r. n. and t. c. weakened. Abdomen short for a male, shining black, thinly hairy, not spotted or banded. Microscopical characters:—Front striate (very obliquely at sides above), with punctures between the striæ; middle of mesothorax minutely tessellate between the punctures, at sides and in front lineolate; disc of scutellum hardly at all punctured; area of metathorax irregularly subreticulate; punctures of abdomen very minute, not at all dense.

*Hab.* Croydon, Australia (*S. W. Fulton*; Nat. Mus. Victoria, 200).

Quite unique, but apparently allied to the green *H. pur-nongensis*, having a similar head.

*Halictus seductus*, sp. n.

♀.—Length about 10 mm.

Black, robust, with greyish-white hair, mixed with fuscous on vertex and mesothorax; mandibles entirely black; flagellum very obscurely brownish beneath. Legs black, with white hair, a band of fuscous hair on outer side of hind tibiæ; clypeus strongly punctured and more or less striate; front dull; mesothorax roughened and strongly punctured, dull, with the disc somewhat shining; scutellum rough, but somewhat shining; area of metathorax sharply defined, strongly striate, produced and pointed in middle behind; lateral margins of truncation sharply defined; hind spur appearing simple, its hind margin very feebly microscopically nodulose; tegulæ piceous. Wings smoky hyaline, stigma and nervures dusky ferruginous; second s.m. very broad, receiving first r.n. well before end; outer t.-c. and r.n. very weak. Abdomen shining, not distinctly punctured, lateral basal margins of second and third segments with bands of white tomentum, and a similar band on fourth hidden under margin of third; apex with fuscous hair; venter with glistening white hair, but no curled scopa. Microscopical characters:—Front striate-punctate; sides of mesothorax cancellate, passing in the middle into oblique wave-like rugæ; punctures of second abdominal segment excessively small, nowhere dense.

*Hub.* "Windsor, Victoria, 1909" (*French*; Froggatt coll. 93).

Resembles *H. representans*, Sm., but easily known by the sculpture of the mesothorax. The microscopical characters and larger size readily separate it from *H. gilesi*, Ckll.

*Halictus circumdatus*, sp. n.

♀.—Length about 8½ mm.

Black, shining, with thin greyish-white hair; mandibles red apically; flagellum dark, with a very faint reddish tint beneath; small joints of tarsi more or less reddened; hair of vertex all pale, but that of scutellum and mesothorax mixed with fuscous; head broad; clypeus shining, with strong irregular punctures; front dull in middle, glistening at sides; mesothorax shining, strongly but not very densely punctured; scutellum very irregularly punctured, some of the punctures very minute, others large, and a median slender groove; area of metathorax concave, shining, strongly longitudinally plicate, sharp-edged, with the apical marginal area smooth and shining, depressed in middle; mesopleura



strongly obliquely striate. Legs with light hair, pale fuscous on posterior side of hind tibiæ; tegulæ piceous, with a rufous spot. Wings dusky, nervures and stigma dusky reddish; second s.m. broad, receiving first r.n. near end; outer t.-c. and r.n. weakened. Abdomen rather elongate, pure black, shining, very finely punctured, bases of second to fourth segments with dense bands of clear white tomentum, visible only as triangular lateral patches on second; a long narrow caudal plate; hair of apex fuscous; long white hair of venter somewhat curled.

*Hab.* "Rutherglen, Victoria" (*French*; Froggatt coll. 174).

Resembles *H. representans*, but easily separated from this and from *H. seductus* by the character of the metathoracic enclosure. There is a strong resemblance to *H. costulatus*, Kriechb. (Mark Brandenburg, Falkenberg, June 6, 1875; Gerstaecker coll.).

*Halictus sanguinipes*, sp. n.

♂.—Length about 8 mm.

Black, with bright chestnut-red legs; clypeus with a very broad pale yellow band, pointed at each end, and with an upwardly-directed point in middle; mandibles black; flagellum very obscurely reddish beneath; hair of head and thorax dull white below, faintly brownish dorsally; front dull and minutely granular, even at sides; mesothorax rough, glistening; scutellum brilliantly shining, with irregular punctures; area of metathorax very long, irregularly wrinkled; truncation small, with sharp lateral margins; tegulæ piceous, with a rufo-testaceous spot. Wings reddish, more dusky at apex; stigma and nervures ferruginous; second s.m. rather narrow; first r.n. joining second t.-c.; outer nervures strong. Abdomen black, shining, very finely punctured, without hair-bands or spots, clavate in form, narrowing basally; red apical plate extremely broad, truncate, faintly emarginate in middle. The coxæ and trochanters are black, contrasting with the red femora. The front is microscopically striate, with coarse punctures between the striæ.

*Hab.* "Windsor, Victoria" (*French*; Froggatt coll. 182).

Close to *H. bicingulatus*, but easily separated by the clavate abdomen, the colour of the tegulæ, and the area of the metathorax.

*Halictus eurhodopus*, sp. n.

♀.—Length about 5 mm.

Rather slender, black, with the legs, except the coxæ, bright clear ferruginous; pubescence dull white, no hair-bands or patches on the smooth shining abdomen; mandibles red apically; scape long, red; flagellum dark; face, front, and mesothorax dull or slightly shining, but not at all polished, with no evident sculpture under a lens; area of metathorax large, minutely reticulate, with shining rim; tegulæ light reddish testaceous. Wings hyaline, a little dusky, stigma piceous, nervures fuscous; first r. n. meeting second t.-c.; third s.m. very short. Abdomen with a narrow red apical plate; venter with a curled white scopa. Microscopical characters:—Front microscopically tessellate (not punctured or striate); mesothorax minutely roughened; abdomen minutely transversely lineolate; spur of middle tibia minutely short-pectinate.

*Hab.* Cairns, Queensland, "Kur. 1. 02" (*Turner*).

A very distinct little species, allied to *H. cassiæfloris*, but distinguished by the red femora.

*Halictus cassiæfloris*, sp. n.

♀.—Length about 5 mm.

Rather robust, with broad abdomen; black, with dull white hair, not forming bands or spots on abdomen; mandibles clear red; scape clear red, the apical half above black or nearly; flagellum dusky reddish below; knees, tibiæ, and tarsi clear ferruginous; tubercles with a red mark; tegulæ light rufo-testaceous; head broad; front dullish, without evident sculpture; mesothorax dull; area of metathorax large, rough, with a shining rim. Wings greyish hyaline, stigma piceous, nervures sepia; first r. n. meeting second t.-c.; outer r. n. and t.-c. very weak; third s.m. very short, not larger than second. Abdomen moderately shining; venter with long hair. Microscopical characters:—Front and mesothorax minutely tessellate; area of metathorax with fine irregular ridges; abdomen very finely transversely lineolate; hind spur with three long stout spines.

*Hab.* Mackay, Queensland, two at *Cassia*, Dec. 1899 (*Turner*, 14 a). Related to *H. eurhodopus*, the two forming a little group or section.

*Halictus kurandensis*, sp. n.

♂.—Length about  $6\frac{1}{2}$  mm.

Rather robust, black, with dull white hair; apical half of clypeus (narrowing laterally, not reaching sides) bright lemon-yellow, but the actual margin light ferruginous; labrum pale reddish; mandibles with apical part chestnut-red; clypeus prominent, face narrowed below; flagellum very long (about 4 mm.), strongly crenulate beneath, very obscurely reddish; front dull; cheeks small; tubercles slightly brownish; disc of mesothorax glaucous, with very fine scattered punctures; area of metathorax very large, hardly defined at sides, covered with labyrinthiform ridges; mesopleura obliquely striated; truncation of metathorax very sharply defined at sides; tegulae rather large, piceous, with the margin narrowly lighter. Wings hyaline, slightly dusky, strongly iridescent; stigma and nervures ferruginous; outer nervures strong; first r. n. meeting second t.-c.; second s.m. higher than broad. Legs reddish-black, the tarsi obscure reddish brown. Abdomen shining, without hair-bands; broad apical margins of segments strongly shining and slightly elevated, but the region before them duller and more or less glaucous. The microscope shows the front to be coarsely striato-punctate.

*Hab.* Cairns, Queensland, "Kur. 4.02" (Turner).

By the striated pleura it resembles *H. circumdatus*; by the glaucous mesothorax it resembles *H. tertius*; from both it is readily separated by the sculpture and other characters.

*Halictus helichrysi*, sp. n.

♀.—Length about 7 mm.

Black, with dull white hair, the broad abdomen thinly hairy at sides and dorsally beyond middle, but not banded; mandibles bidentate, with more than the apical half chestnut-red; flagellum chestnut-red beneath, except at extreme base; hind margins of second and third abdominal segments narrowly reddish, of fourth broadly hyaline; legs black, tarsi reddened apically; head broad; clypeus shining, with irregular not very large punctures; front glistening at sides, dull in middle, where it is extremely densely punctured, the punctures more or less in rows; mesothorax shining, with strong well-separated punctures; scutellum shining, with very small punctures; metathoracic area with very fine sinuous rugae; sides of apical truncation not sharply defined; tegulae rufous, piceous at base. Wings clear, nervures and

stigma sepia; outer t.-c. and r. n. weakened; first r. n. meeting second t.-c.; hind spur with a few large teeth. Abdomen shining, finely punctured; venter with stiff white hair, but no curled scopa.

*Hab.* Tambourine Mountain, Queensland, at flowers of *Helichrysum bracteatum*, Oct. 27, 1912 (*H. Hacker*, Queensl. Mus. 84); also a cotype from Brisbane, Jan. 17, 1912 (*Hacker*; Queensl. Mus. 31).

Easily known from *H. griseovittatus* by the absence of hair-bands at bases of abdominal segments.

The following three species are very like *H. helichrysi*, the four being separable as follows:—

- |   |                         |
|---|-------------------------|
| Flagellum dark, faintly brownish beneath .....  | <i>H. imitans.</i>      |
| Flagellum red beneath .....   | 1.                      |
| 1. Mesothorax strongly punctured; scutellum with sparse small punctures; hind margin of fourth abdominal segment broadly whitish hyaline .... | <i>H. helichrysi.</i>   |
| Mesothorax more finely punctured; hind margin of fourth segment not broadly whitish hyaline ..  | 2.                      |
| 2. Lateral bases of abdominal segments 2 to 4 broadly white-tomentose; scutellum duller, more closely punctured .....                         | <i>H. victoriellus.</i> |
| Lateral bases of abdominal segments 2 to 4 not white-tomentose; scutellum shining, very minutely and more sparsely punctured .....            | <i>H. plebeius.</i>     |

*Halictus imitans*, sp. n.

♀.—Length about  $6\frac{1}{2}$  mm.

Black, robust, with scanty dull white hair, faintly creamy on head and thorax above; mandibles with the apical part variably dark reddish; antennæ entirely dark; clypeus shining, with sparse weak punctures; front dull, somewhat glistening at sides, the middle punctured and feebly striate; mesothorax glistening, but quite strongly and densely punctured; scutellum with minute, rather close punctures; area of metathorax large, finely and regularly striate; hind spur with a large subbasal tooth; tegulæ piceous, with a large rufous spot. Wings dusky, nervures and stigma dusky red; outer r. n. and t.-c. weakened; first r. n. meeting second t.-c. Abdomen shining, very minutely punctured; lateral bases of second and following segments with rather inconspicuous patches of dull white tomentum, on third segment twice as extensive as on second; venter with abundant white hair.

*Hab.* Victoria, Feb. 1901 (*C. F.*; Turner coll.). Two specimens.

*Halictus victoriellus*, sp. n.

♀.—Length a little over 6 mm.

Like *H. imitans*, but smaller and less robust, with the flagellum dull red beneath; mesothorax more shining and finely punctured; area of metathorax shorter, with weaker striæ, which are oblique, and on the basal half joined by many little cross-ridges; stigma testaceous (instead of castaneous); hind margins of abdominal segments suffused by reddish; hair of venter short and not abundant.

*Hab.* Victoria, Feb. 1901 (*C. F.*; Turner coll.). Two specimens.

*Halictus plebeius*, sp. n.

♀.—Length about  $6\frac{1}{2}$  mm.

Like *H. imitans*, but mesothorax and scutellum much more shining, with fine punctures; flagellum dull red beneath; area of metathorax shorter, with much less distinct striæ, which frequently anastomose, so that the surface is cancellate; stigma smaller; hind spur yellowish white (red in *imitans*). The first and second abdominal segments are very finely, but distinctly and regularly punctured; the front is densely striato-punctate.

♂.—Length a little over 5 mm.

Clypeus with a broad ivory-coloured band on apical half; flagellum long and rather thick, obscurely brownish beneath; cheeks not enlarged; legs black, with very slender reddish-brown tarsi; area of metathorax so finely reticulate as to appear roughened under a lens; abdomen shining, not hairy. The tegulæ have a clear testaceous spot. Known from related males by the small size and dark legs.

*Hab.* Purnong, near Murray R., S. Australia (*S. W. Fulton*; Nat. Mus. Vict. 108, 157). The female is the type.

*Halictus idoneus*, sp. n.

♂.—Length about 7 mm.

Slender, black, with white hair; mandibles rufous apically; lower half of clypeus cream-colour, depressed in middle; flagellum long, entirely dark, very strongly crenulated beneath; legs black, with the tarsi, and extreme apices of tibiæ, clear ferruginous; abdomen parallel-sided, with the extreme bases of third and fourth segments reddened. Face rather broad, with much white hair; middle of front

dull, densely but shallowly punctured; mesothorax very densely and shallowly punctured, but glistening; scutellum shining, finely punctured; area of metathorax appearing rough under a lens, but with fine ridges, connected by transverse ones, the apical part with an exceedingly minute cancellation, the cells transversely elongate; apical truncation without sharp lateral margins; tegulae rufo-testaceous. Wings perfectly clear; stigma light reddish, with darker margin; nervures sepia; outer r. n. and t.-c. rather slender, but dark; second s.m. narrow; first r. n. meeting second t.-c. Abdomen with a very thin pruinose pubescence, and indistinct patches of tomentum at lateral bases of segments; apical plate dark brown, very broad, and rounded. The second abdominal segment is very densely punctured in the subbasal region.

*Hab.* Brisbane, Queensland, Oct. 3, 1912 (*Hacker*; Queensl. Mus. 72).

Readily known from *H. blackburni* by the rough mesothorax, the dense punctures visible under a lens. Compared with *H. forresti*, the clypeus is less produced, and the mesothorax is very much more densely punctured.

*Halictus mediopolitus*, sp. n.

♀.—Length about  $6\frac{1}{2}$  mm.

Black, with very pale ochreous-tinted or creamy hair; mandibles dark; head broad, clypeus and supraclypeal area shining, with sparse small punctures; sides of face and front glistening, middle of front dull, striate, with small punctures at intervals between the striae; flagellum dark, the last two joints lively red beneath; mesothorax and scutellum bare, highly polished, and shining; mesothorax with sparse very minute punctures and very widely scattered large ones; scutellum with extremely minute sparse punctures, principally about the median depression; area of metathorax very large, semilunar, appearing granular under a lens, but actually minutely reticulate, the margin finely punctate; posterior truncation small, sharply defined at sides below. Legs black, the apical tarsal joints ferruginous; hind spur with a single large blunt subbasal lamina; tegulae clear rufo-testaceous. Wings clear, stigma and nervures dusky, rufous, the stigma very long; outer r. n. and t.-c. evanescent; second s.m. very broad, receiving first r. n. near apex. Abdomen shining, minutely and quite closely punctured; segments 2 to 4 with dense basal bands of creamy-

white tomentum, much broadened at sides; venter with stiff white hair, no curled scopa.

*Hab.* Purnong, near Murray R., S. Australia (*S. W. Fulton*; Nat. Mus. Vict. 136, 216, 224).

A distinct species, readily known by the highly polished mesothorax and scutellum, and the dense conspicuous abdominal hair-bands.

*Halictus opacicollis*, sp. n.

♀.—Length about 7 mm.

Black, with scanty dull white hair; mandibles black, with a faint subapical reddish spot; flagellum very obscurely brownish beneath; head broad; clypeus opaque, with sparse rather large punctures, except the lower margin, which is broadly shining; supraclypeal area dull; middle of front dull, finely striate, with obscure punctures between the striæ; mesothorax dull, minutely tessellate, with widely scattered very shallow punctures; scutellum shining, dull in middle and posteriorly; area of metathorax very large, finely but very distinctly striate. Legs reddish black or obscurely brownish, small joints of tarsi ferruginous; hind spur with a large blunt tooth near the middle, and beyond that a long low keel; tegulæ piceous, with a rufous or pallid spot. Wings dusky, the large stigma dull red, nervures fuscous; outer r. n. and t.-c. weakened; second s.m. very broad, receiving first r. n. a short distance before its end. Abdomen broad, somewhat shining, the hind margins of the segments obscurely reddish, or the whole abdomen very dark brown; small triangular patches of dull whitish tomentum at lateral bases of segments 2 to 4, not very conspicuous; first two abdominal segments transversely lineolate, subtessellate, hardly at all punctured.

*Hab.* Victoria (type locality), Feb. and Sept., 1901 (*C. F.*; Turner coll.); Hobart, Tasmania (*Lea*; Froggatt coll. 165).

A commonplace-looking species, distinguished from *H. orbatus*, Sm., by the less strongly punctured mesothorax and other characters. The surface of the mesothorax, under a lens, looks much like that of the New Zealand *H. smithii*, D. T. The Tasmanian specimens are smaller than those from Victoria, with browner abdomen.

*Halictus granulithorax*, sp. n.

♀.—Length about 6½ mm.

Black, robust, with dull white hair, slightly tinged with brownish dorsally; mandibles obscurely reddish in middle;

clypeus quite closely punctured, the punctures of different sizes; supraclypeal area dullish, finely punctate; front dull, extremely densely, subconfluently punctured, the punctures tending to run in vertical rows; antennæ dark; mesothorax dull, appearing granular under a lens, extremely densely punctured; scutellum somewhat shining, well punctured, but not so densely as mesothorax, and shining between the punctures; area of metathorax large, very feebly sculptured, the surface minutely tessellate, the sides with fine ridges reaching halfway to margin, the middle irregularly reticulated; hind spur with a short tooth, and a long low feebly dentate lamella; tegulæ fulvous. Wings faintly dusky, stigma and nervures reddish sepia; outer r. n. and t.-c. weakened; second s.m. broad, receiving first r. n. before its end, or (Pt. Lonsdale specimen) first r. n. meeting second t.-c. Abdomen broad, hind margins of segments suffusedly reddish; first two segments minutely transversely wrinkled and rather closely punctured; lateral base of second segment with a little dull pale tomentum, and bases of third and fourth with the same right across; venter with short white hair, toward base longer and somewhat curled.

*Hab.* Victoria (type locality), Feb. 1901, two (*C. F.*; Turner Coll.); Pt. Lonsdale, Jan. 1908 (*J. A. Kershaw*; Vict. Nat. Mus. 265). Very like *H. willsi*, Ckll., but the second s.m. is differently shaped, and the sculpture of the front, metathorax, and abdomen differ.

*Halictus niveifrons*, sp. n.

♂.—Length about  $4\frac{3}{4}$  mm.

Black, with white hair, copious and snow-white on face and front; mandibles bright red at apex; face strongly narrowed below; clypeus with tegument entirely black, covered with densely plumose white hairs; antennæ wholly dark, flagellum stout, comparatively short, almost like that of a female; front minutely, very densely striato-punctate; mesothorax somewhat shining, microscopically lineolate-tessellate, without evident punctures; area of metathorax dull, feebly striatulate basally; tegulæ clear testaceous. Wings clear, the stigma large, piceous; nervures fuscous, outer r. n. and t.-c. very weak; second s.m. much higher than broad, receiving first r. n. well before middle; third s.m. very short, no larger than second. Abdomen broad, black, and shining, without hair-bands or patches; the surface very finely and weakly transversely lineolate, without evident punctures.

*Hab.* Tasmania, two males (*Lea*; Froggatt coll. 144).



Readily known by the dark clypeus, small size, and white hair on face. I do not know a close relative.

*Halictus repertus*, sp. n.

♂.—Length about  $6\frac{1}{2}$  mm.

Black, rather slender, with dull white hair; head broad; mandibles broadly bright red in middle; lower half of clypeus cream-colour, shining and sparsely punctured; antennæ long, entirely dark; front dull, extremely densely punctured, except at sides, where the punctures are elongated, and well separated; mesothorax shining, quite strongly punctured, the punctures about as far apart as the diameter of one, the surface between minutely and feebly lineolate; scutellum shining, sparsely punctured; area of metathorax with coarse irregular ridges, with transverse ones between, the marginal area finely lineolate, and inclined to be tessellate; knees, tibiæ at extreme apex, and tarsi entirely, ferruginous; tegulæ rufous. Wings hyaline, slightly milky, stigma and nervures ferruginous; outer nervures hardly at all weakened; second s.m. higher than broad, receiving first r. n. just before end; third s.m. considerably larger than second. Abdomen shining, but not highly polished, hind margins of segments broadly dusky reddish, the extreme margins becoming hyaline; no hair-bands or patches; first two dorsal abdominal segments with very fine, not at all dense punctures; apex with a very large, broadly rounded, bright ferruginous plate (as in the *hedleyi-tasmaniae* group); ventral segments fringed with white hair.

*Hab.* Near Melbourne (Nat. Mus. Victoria, 105). Very close to *H. cambagei*, Ckll., which has a similar caudal plate, but metathorax different.

*Halictus expansifrons*, sp. n.

♂.—Length about 6 mm.

Black, robust (like a female), with dull white hair; head broad; mandibles dark; clypeus with a transverse pale yellow band, having a triangular median projection above; antennæ rather long, flagellum thick, obscure reddish beneath; front dull, extremely densely punctured, the punctures (seen under microscope) glistening; mesothorax shining, strongly punctured, sparsely in middle, densely in front, the surface between the punctures smooth and polished; scutellum shining, finely punctured, not depressed in middle; area of metathorax under a lens appearing

rugose, with a thick shining rim ; under the microscope the sides of the area show strong ridges, which are vertical, not oblique ; lateral margins of posterior truncation not sharply defined ; tegulæ fulvous or rufo-fulvous. Wings clear, stigma and nervures ferruginous ; outer nervures scarcely weakened ; second s.m. broad below ; first r. n. meeting second t.-c., or entering extreme apical corner of second s.m. Legs black, the knees and apices of tibiæ more or less pale reddish ; tarsi cream-colour, becoming pale ferruginous apically. Abdomen broad, shining, first two segments finely, not densely punctured ; hind margins of segments very faintly, variably, reddish ; bases of second and following segments with bands of pale tomentum, not always exposed ; apical plate very broad, dark.

*Hab.* New South Wales, two specimens (Nat. Mus. Victoria, 102). Closely allied to *H. clelandi*, Ckll., but mesothorax and tarsi different.

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LX.—*New Non-Marine Mollusca from Peru and Argentina.*

By H. B. PRESTON, F.Z.S.

*Ammonoceras pebasensis*, sp. n.

Shell small, depressedly conoid, with somewhat tumid last whorl and base, greenish yellow, polished, a little shining ; whorls 5, regularly increasing, the apical whorls smooth, the remainder sculptured with fine, closely-set, somewhat wavy, spiral striæ crossed by transverse growth-plication ; suture deeply impressed, indistinctly margined below ; umbilicus moderately broad, deep, well-like, occupying about one-fifth of the total diameter of the shell ; columella margin descending somewhat obliquely, diffused above into a well-defined, restricted, parietal callus which reaches to the upper margin of the labrum ; labrum acute, aperture ovate.

Alt. 3, diam. maj. 5, diam. min. 4.5 mm.

Aperture : alt. 2.25, diam. 1.75 mm.

*Hab.* Forests about Pebas, Rio Marañon, N.E. Peru.

*Ammonoceras pucayaënsis*, sp. n.

Shell small, orbicular, very depressed, semitransparent, vitreous, tinged with yellowish cream-colour and painted

with multitudinous, narrow, spiral bands of the same; whorls 5, somewhat flattened, regularly increasing, sculptured with radiate, transverse striæ and extremely fine and closely-set, rather wavy, microscopic, spiral striæ; suture impressed; base of shell not very convex, sculptured as on the spire; umbilicus wide; columella margin obliquely descending, curved below, diffused above into a restricted, well-defined, whitish, parietal callus which reaches to the upper margin of the labrum; labrum simple acute, receding below, a little projecting in front; aperture broadly and rather compressedly and obliquely sublunate.

Alt. 3·25, diam. maj. 7·25, diam. min. 6·25 mm.

Aperture: alt. 2·5, diam. 2·25 mm.

*Hab.* Rio Pucaya, Eastern Peru, at an altitude of 250 feet.

*Ammonoceras rosenbergiana*, sp. n.

Shell allied to *A. pucayaënsis*, Preston, but of a pale yellowish-olive tint, with no trace of spiral colour-bands, the spire is rather more exserted, and, while the spiral striæ are even finer, the transverse striæ are much more pronounced; the suture is narrowly margined below, which is not the case in *A. pucayaënsis*, the last whorl descends somewhat, the umbilicus is much narrower, and the parietal callus is of a reddish hue.

Alt. 3·5 (nearly), diam. maj. 7, diam. min. 6·25 mm.

Aperture: alt. 2·75, diam. 2·25 (nearly) mm.

*Hab.* Rio Pucaya, Eastern Peru.

*Bulimulus apicepunctata*, sp. n.

Shell fusiform, reddish brown, variegated with oblique, transverse, cream-coloured bands; whorls  $6\frac{1}{2}$ , not very convex, regularly increasing, the last rather long, the first two and a half regularly spirally punctate, the remainder smooth, but for transverse growth-lines; suture impressed, narrowly margined below with white; base of shell shouldered round the umbilicus, umbilicus somewhat broad, deep; columella margin vertically descending in a slight curve, thin, broadly outwardly expanded, diffused above into a light, well-defined, parietal callus, which enters the shell just behind the upper margin of the labrum; labrum whitish, outwardly expanded at the base, a little bent inwards over the aperture above; aperture rather elongately ovate.

Alt. 17·5, diam. maj. 9, diam. min. 7 mm.

Aperture: alt. 7·75, diam. 3·75 mm.

*Hab.* Santa Rita, E. Peru.

*Orthalicus sultana angustior*, sp. n.

Shell differing from typical *Helix sultana*, Dillwyn \*, in its more exserted spire and much narrower form.

Alt. 65, diam. maj. 40, diam. min. 33 mm.

Aperture : alt. 41, diam. 23.5 mm.

*Hab.* Eastern Peru.

*Opeas contamanoënsis*, sp. n.

Shell obtusely subulate, polished, shining, greyish green ; whorls  $8\frac{1}{4}$ , the first two and a quarter submamillary, the remainder slowly and regularly increasing, somewhat convex, marked with slightly oblique, transverse striæ ; suture well impressed, irregularly crenellated and narrowly margined below ; columella margin very slightly curved, obliquely truncate below, labrum simple acute ; aperture broadly and rather shortly inversely auriform.

Alt. 15, diam. maj. 3.75, diam. min. 3.5 mm.

Aperture : alt. 3, diam. 1.5 mm.

*Hab.* Contamano, Rio Ucayali, Eastern Peru.

After examination of a long series of *Opeas octona*, Ein., from many localities, I have been unable to altogether reconcile the above species with any of them, though it is undoubtedly closely allied to that form.

*Helicina basifilaris*, sp. n.

Shell rather depressedly conic, slightly polished, brownish yellow, painted with a broad band of pale reddish on the lower half of the whorls, and showing to flesh-colour on the base of the shell ; whorls  $3\frac{1}{2}$ , the last acutely carinate at the periphery, closely and lightly, spirally lirate ; suture impressed, very narrowly margined above ; base of shell sculptured with very closely-set, somewhat wavy, radiate, microscopic striæ, crossed by very fine, wavy, revolving striæ and marked with fine, somewhat distant, dark, revolving colour-lines ; columella margin obliquely descending above, excavated below, thickened into an almost nodulous projection at the base, whitish, outwardly and upwardly extending into a granular, parietal callus ; labrum bright yellow, receding below, narrowly outwardly expanded and reflexed, the outward expansion considerably diminishing above ;

\* Descriptive Cat. ii. 1817, p. 920.

aperture roughly subtriangular; operculum harp-shaped, concave, horny, laminiferous, granular, very dark chestnut shading to a paler hue towards the laterally placed nucleus.

Alt. 4·5, diam. maj. 7·5, diam. min. 6 mm.

Aperture: alt. 3, diam. 3·25 mm.

*Hab.* Rio Pucaya, Eastern Peru.

*Helicina contamanoënsis*, sp. n.

Shell broadly conoid, polished, shining, dark yellowish flesh-colour; whorls 5, not very convex, regularly increasing, the last acutely carinate, gradually descending in front, marked with arcuate growth-lines and sculptured with very fine, confused, oblique striæ and distant spiral ridges; suture lightly impressed, narrowly, callously margined below; columella white, descending obliquely, and developed into an outwardly directed, nodular projection at the base, outwardly, callously diffused above into a thin, well-defined, granular, parietal callus; labrum white, narrowly expanded and reflexed especially below, coarsely granular, receding towards the base, outwardly extended above; aperture broadly sagittiform; operculum corneous, slightly concave, somewhat granular, laminiferous, with lateral nucleus, reddish-chestnut shading to dark yellow towards the nucleus.

Alt. 9, diam. maj. 15, diam. min. 12·5 mm.

Aperture: alt. 5, diam. 6·5 mm.

*Hab.* Contamano, Rio Ucayali, Eastern Peru.

Allied to *H. rhyncostoma* (Shuttl.), Pfr. \*, but with narrower and higher aperture; moreover, the spire is not laterally concave as in that species.

*Helicina inca*, sp. n.

Shell allied to *H. contamanoënsis*, Preston, but differing from that species in its more depressedly conoid form and greenish-yellow colour, and in being painted with a narrow, reddish, subcarinal band; the last whorl does not descend so much in front, and the distant spiral ridges of *H. contamanoënsis* give place to rather closely-set, impressed, spiral lines, while the base of the shell is sculptured with fine, closely-set, revolving striæ; the columella is more excavated and is quite rounded, lacking the nodular projection at the base; the aperture is rather less broadly sagittiform and the labrum is rather less outwardly expanded than is the case in that species.

\* Shuttleworth in Pfeiffer, Mon. Pneum. iii. 1865, p. 245.

Alt. 8·5, diam. maj. 16, diam. min. 13 mm.

Aperture: alt. 6, diam. 6·5 mm.

*Hab.* Eastern Peru.

*Helicina lacerata*, sp. n.

Shell turbinately conic, bright yellow; whorls  $4\frac{1}{2}$ , slightly inflated, regularly increasing, the last acutely carinate at the periphery, sculptured with moderately closely-set spiral liræ, very obliquely crossed by minute, confused, scratch-like striæ; suture lightly impressed, very narrowly callously margined above; base of shell sculptured with irregular, fine, wavy, revolving liræ, considerably confused by the oblique scratch-like striæ which are also present on this portion of the shell; columella margin whitish, descending in a gentle curve, thickened at the base into a slight nodular concretion, spreading outwards and upwards into a thin, ill-defined, granular parietal callus; labrum yellow, outwardly expanded, reflexed, and receding below, projecting above, where it ceases to be reflexed; aperture obliquely subrectangular, rounded at the base; operculum horny, dark chestnut, shading to pale red in the median and nucleal regions, yellowish towards the base on the inner margin, slightly concave, granular, lamini-ferous, with lateral nucleus.

Alt. 6, diam. maj. 8, diam. min. 7 mm.

Aperture: alt. 3·75, diam. 3·75 mm.

*Hab.* Rio Pucaya, Eastern Peru, at an altitude of 250 feet.

*Helicina syngenes*, sp. n.

Shell allied to *H. lacerata*, Preston, but rather more broadly conic in shape and lacking the inflation of the whorls; it is also of a pale flesh-colour; the liræ on the spire and base of *H. lacerata* give place in the present species to coarse, closely-set, spiral striæ, while the basal columellar nodule is wanting.

Alt. 6, diam. maj. 9, diam. min. 7·5 (nearly) mm.

Aperture: alt. 3·75, diam. 3·75 mm.

*Hab.* Rio Pucaya, Eastern Peru, at an altitude of 250 feet.

*Helicina pucayaënsis*, sp. n.

Shell globosely turbinate, greenish grey, covered with a thin, hispid, light brownish periostracum; whorls  $4\frac{1}{2}$ , the upper whorls flattened, the last inflated, the embryonic whorl

sculptured with spiral punctate lines, the remaining whorls with very fine and oblique, confused, scratch-like striæ; suture very lightly impressed, very narrowly margined below, the margin being of a whitish colour; columella margin very obliquely descending, curved below, spreading outwards into a callous thickening and diffused upwards into an ill-defined, granular, parietal callus; labrum narrowly outwardly expanded and reflexed, pale flesh-coloured, notched at its junction with the columella; aperture obliquely and very broadly semilunate; operculum concave, transparent, calcareous, pale flesh-coloured, laminiferous, granular, with subcentral nucleus.

Alt. 6·25, diam. maj. 7·5, diam. min. 6 mm.

Aperture: alt. 3·75, diam. 3·25 mm.

*Hab.* Rio Pucaya, Eastern Peru, at an altitude of 250 feet.

*Helicina serina*, sp. n.

Shell conically turbinate, bright yellow, painted with a narrow cream-coloured peripheral band, and shading to the same colour in places on the base; whorls 5, regularly increasing, the last angled at the periphery, the embryonic whorls minutely pitted, the remainder marked with transverse growth-lines, crossed in all directions by oblique scratch-like striæ; suture impressed, very narrowly margined with white below; base of shell moderately convex, showing the scratch-like striæ of the spire, densely radiately striate; columella margin descending in a short and very gentle curve, outwardly callously thickened, and diffused upwards into an ill-defined, coarsely granular, parietal callus; labrum narrowly outwardly expanded and reflexed, of a granular texture, bearing a slight notch at the base of the columella, in colour a bright intense yellow; aperture rather oblique, broadly and depressedly sublunate; operculum horny, reddish-chestnut coloured, granular, a little convex, laminiferous, with lateral nucleus.

Alt. 9, diam. maj. 10, diam. min. 8·25 mm.

Aperture: alt. 4·25, diam. 4·75 mm.

*Hab.* Contamano, Rio Ucayali, Eastern Peru.

*Ampullaria contamanoënsis*, sp. n.

Shell roughly ovate, broadly umbilicate, ashen grey, shading to yellowish brown below, and painted with spiral

chocolate bands of irregular width ; whorls  $4\frac{1}{4}$ , almost planulate above, then shouldered and rounded below, the last descending considerably in front and rather elongated towards the base, smooth ; suture impressed, painted below with a very broad, whitish-grey, spiral band ; umbilicus funnel-shaped, deep ; columella margin acute, almost erect, descending in a curve ; labrum acute, slightly dilated below ; aperture elongately ovate ; interior of shell livid greyish brown, shading to chocolate.

Alt. 52, diam. maj. 42·5, diam. min. 36 mm.

Aperture : alt. 39, diam. 22 mm.

*Hab.* Contamano, Rio Ucayali, Eastern Peru.

*Corbicula bermejoensis*, sp. n.

Shell subtrigonal, whitish cream-colour, almost smooth, marked only with very fine concentric striæ ; dorsal margin arched ; ventral margin gently curved ; anterior side rounded ; posterior side rather abruptly descending, angled below ; right valve bearing a very oblique, marginal anterior and two short, solid, posterior cardinal teeth and two curved serrated laterals on either side ; left valve bearing two solid and divergent anterior and a very oblique, slightly curved and elongated, well-developed posterior cardinal tooth, and a coarsely serrated curved lateral on either side.

Long. 9, lat. 9·25 mm.

*Hab.* Rio Bermejo, a tributary of the Rio Chaco, N. Argentina (*Clark*).

*Corbicula approximans*, sp. n.

Shell differing from *C. bermejoensis*, Preston, in its much more ovate form, it being much more laterally produced on either side, but especially anteriorly, than in that species ; it is also much more coarsely concentrically striate, and the cardinal teeth are weaker, chiefly in the right valve.

Long. 10 (nearly), lat. 11 (nearly) mm.

*Hab.* Rio Bermejo, a tributary of the Chaco, N. Argentina (*Clark*).



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LXI.—On the Ornithosaurian Genus *Ornithocheirus*, with a Review of the Specimens from the Cambridge Greensand in the Sedgwick Museum, Cambridge. By REGINALD WALTER HOOLEY, F.G.S.

[Plate XXII.]

THE genus *Ornithocheirus* was founded by Seeley on numerous fragments of jaws and odd bones of Pterodactyls from the Cambridge Greensand, preserved in the Woodwardian (now the Sedgwick) Museum of the University of Cambridge. All the specimens are more or less water-worn. The most perfect are a humerus, femur, and several carpal bones. The first character laid down as pertaining to the genus \* was "no teeth anterior to the palate," which, later †, was negatived by the statement that "the teeth are prolonged anterior to the muzzle," and another character is added, "the palate has a longitudinal ridge." In 1881 ‡ an explanation of the amendment was given, from which it appears that the genus *Ornithocheirus* was originated to include three deep club-shaped jaws of the type of *Pterodactylus sinus*, Owen, and *Ptenodactylus*, for the spear-shaped jaws of the type of *Pterodactylus sedgwicki*, Owen. Hence the definition of the

\* Seeley, H. G., 'Index to Aves, &c. Woodwardian Museum,' 1869, p. xvi.

† *Id.* 'Ornithosauria,' 1870, p. 112.

‡ *Id.* *Geol. Mag.* [2] vol. viii. 1881, pp. 15-16.

genus *Ornithocheirus* "no teeth anterior to palate"; but, becoming "convinced" that the type of *Pterodactylus simus* was a lower jaw, Seeley abandoned the genus *Ptenodactylus*, and included all the specimens under *Ornithocheirus*, being thus compelled to add the character "the teeth are prolonged anterior to the muzzle," nullifying the original character of the genus.

Further characters appear to have been added after the discovery of the toothless forms of America, when "it became evident that the bones of the skeleton are mostly formed on the same plan as those of the Cambridge genus *Ornithocheirus*." The foundation for this seems to be that portions of an edentulous jaw had been found in the Cambridge Greensand. These were determined by Owen\* to be the "proximal end of metacarpal of wing," and recognized later by Seeley† as parts of the premaxillæ. In 1891‡ he refers to his provisional name of *Ornithostoma* for these three portions of edentulous jaws, details the resemblances to *Pteranodon*, and finds the only difference is "the American toothless Ornithosaur is twice the size." Then follows the inclusion of characters belonging to *Pteranodon* into both *Ornithocheirus* and *Ornithostoma*. The odd fragmentary bones show the same characters as the American forms, and these are made common both to the toothed and toothless. In regard to the beak, the following description reveals the confused state of things §:—"The beak varies greatly in length and in form, though it is never quite so pointed as in the American genus, for there is always a little truncation in front, when teeth are seen projecting forward from a position somewhat above the palate; the snout is often massive and sometimes club-shaped." In regard to the toothless jaw (*Ornithostoma*), it not only diverges from the original and the amended characters laid down for *Ornithocheirus* in the absence of teeth, but also "in the smooth palate formed by a single wide concave channel," which is widely at variance with the well-developed longitudinal ridge of the palate in the latter. Seeley saw evidence of the crest on specimen no. J. c. 8, 2, a fragment of the back of the skull which he described and figured || in 1870. Twenty-one years later he still held to this, but was apparently shaken in his deter-

\* R. Owen, Rep. Cret. Form. (Mon. Pal. Soc. 1859), Suppl. i. p. 18.

† H. G. Seeley, Ann. & Mag. Nat. Hist. (4) vol. vii. p. 35, footnote (1871).

‡ *Id. ibid.* (6) vol. vii. p. 441 (1891).

§ *Id.* 'Dragons of the Air,' 1901, p. 177.

|| *Id.* 'Ornithosauria,' 1870, pl. xi. fig. 1.

mination\*. An examination of this specimen shows that the bone at the junction of the parietal and occipital regions is raised into a ridge, which is continued laterally, forming the margin of the hinder border of the supratemporal fossæ. This edge is much worn, but it is clear that it was produced upwardly and outwardly, and formed no part of a backwardly directed crest. Seeley† remarks that the occiput is flat, but, if the borders were perfect, there would be a slight concavity. Above the foramen magnum are the remains of a vertical ridge. Its present vertical extent is 6 mm., its probable length in life 10 mm. Its greatest breadth is only 4 mm. It is very insignificant, and no more than the ridge along the line of the median union of the occipitals, as in many of the Reptilia. The angles at which the sides converge prove its posterior termination to have been near, with no production backwards as a crest. Seeley‡ says "it may have given attachment to a bone like that post-superoccipital crest described by Quenstedt in the *Pterodactylus suevicus*." The surface is very small, and larger by being worn to its base, therefore no bone of any extent or strength could have been attached here. Moreover, as will shortly be shown, the crest of *Ornithostoma* (*Pteranodon*) arises superior to, overhangs, and has no connection whatever with, the occipital area. In Seeley's figure this ridge, which is depicted with too great a vertical extension, does not approach so close to the foramen magnum. The brain-case and occiput are expanded, totally unlike the compressed condition in *Ornithostoma* (*Pteranodon*), and, by its form, it suggests relationship with the toothed and pointed jaws. The sagittal crest of the genus *Ornithocheirus* is a myth. The supratemporal fossæ were apparently narrow and deep, with the parietal region of the skull constricted, as in *Ornithodesmus latidens*. No post-temporal fossæ are observable. There is nothing in the Cambridge material to prove the absence or presence of an antorbital vacuity. The facts do not favour an *Ornithostoma* (*Pteranodon*)-like skull, but one with a general form corresponding to the shrewd restoration of *Pterodactylus compressirostris* by Owen§ and classified by authors under this very genus *Ornithocheirus*. The specimen J. c. 8, 2 was Seeley's type for the back of the skull of *Ornithocheirus*, and the only hinder region of the skull, other than J. c. 8, 1, known to him. It is very remarkable that all the while the Cambridge material actually

\* H. G. Seeley, Ann. & Mag. Nat. Hist. (6) vol. vii. p. 443 (1891).

† *Id.* 'Ornithosauria,' 1870, p. 84.

‡ *Id. ibid.* p. 84.

§ R. Owen, Cret. Rep. (Mon. Pal. Soc. 1851) pl. xxvii. fig. 1.

included the greater portion of the hinder part of the skull of *Ornithostoma* (*Pteranodon*), from the posterior moiety of the orbits to the occiput, showing the base of a true and powerful supraoccipital crest. This interesting fossil he described and figured \* as the orbito-ethmoid-sphenoid bone. The tablet J. c. 9, upon which this specimen is mounted, has been labelled "Ethmoid with basisphenoid." An ink-line has since been drawn through this, and someone has written "Parietal with supra-occipital." A cast in wax of the aspect shown in Seeley's fig. 9 is also on the tablet marked "cerebral hemispheres and pineal body." In pl. xi. fig. 8 \* the left side is shown. As the bone is figured, the occiput is horizontal, whereas it should be oblique. The hinder border of the orbit is seen on the left upper half of the bone. The base of the supraoccipital crest extends from the top right-hand corner of the figure to the emargination near the lower. Fig. 7 \* is a portion of the occiput placed upside down. The indentation in the upper border of the figure is the dorsal half of the foramen magnum, while the two foramina on either side below are the post-temporal fossæ (cf. Pl. XXII. fig. 2). The hinder moieties of the orbits are preserved, and are exhibited in fig. 9, pl. xi. In Seeley's explanation of the figure they are called "the cups which covered the anterior termination of the cerebral lobes." The cerebral hemispheres are not exposed at all. The frontal bone immediately posterior to the orbits is greatly compressed, becoming a deep strong keel, which intensifies in the parietal region. Here, where it meets the upper border of the occipital plane, it shows the base of a crest which is destroyed, but, from the section of the bone, it was deep and robust and produced far beyond the occiput, as in *Ornithostoma* (*Pteranodon*) (Pl. XXII. fig. 1). It has no connection with the occiput, which lies below it. The occipital area preserved is small and triangular. There is a strong median vertical ridge to the foramen magnum, on either side of which the surface is concave. In the centre of these surfaces, slightly above the level of the foramen, are the post-temporal fossæ, which are small and subcircular. The skull below the dorsal half of the foramen magnum is destroyed.

The back of the skull J. c. 8, 2 is the type of *Ornithocheirus*, and J. c. 9 belongs to *Ornithostoma* (*Pteranodon*), and the two genera are totally distinct, as the muzzles also prove. The genus *Ornithocheirus* has been given all the

\* H. G. Seeley, 'Ornithosauria,' 1870, pp. 85, 86, pl. xi. figs. 7-9.



characters found amongst this medley of bones and those of the pterodactyls of the Chalk of Kansas. Its effect is seen when Professor Williston \* remarks that "every essential character that has been given so far for the European species of this group agrees quite with those of our Kansas specimens. This will demonstrate how unimportant are the characters derived from the absence or presence of teeth."

In the present case the absence or presence of teeth affords a certain character, although amongst Ichthyosaurs and Aves it has been shown to be not dependable. Therefore it would be extremely unwise to follow this rule too closely, for a toothed condition is a more primitive character in this respect than a toothless. We must make use of the features we have at command when dealing with such fragmentary remains. Moreover, at the time of the deposition of the Cambridge Greensand they were an expiring race and near the end of their line, and thus we are examining the fixed or degraded characters of the ultimate descendants, and not the ancestors. Therefore the peculiarities obtaining have a greater value than if found in the beginners, for they are the specialized result of natural selection acting through ages. The situation of the front pair of teeth in some jaws, right above the palate on the anterior face of the beak, we shall shortly show is an accident caused by the wearing away of the snout. Those without teeth must for a great period have diverged from those with teeth. The fact that the seizure and prehension of food are obtained by such opposite means argues of itself corresponding variations in the form of the bones of the skull. In the Cambridge material many of the teeth are grooved and circular, and certainly more simple and less specialized than the remainder, which are more or less compressed laterally, with an absence of grooving. To conclude that the odd bones belonged to the same individuals, or even to the identical genus, as the fragments of skulls, because they happen to be found on the same horizon, is a dangerous means of diagnosis, and has not infrequently led to error in the past. This danger is intensified when we remember that the Cambridge Greensand is the remains of an old shore-line, where bones of these creatures accumulated, not only from those contemporaneous, but also probably from those derived from older beds, and could not have formed even a tithe of the flocks of these reptiles inhabiting the district.

\* S. W. Williston, "Restoration of *Ornithostoma*," Kansas Quarterly, 1897, p. 35.

It appears that different families possessed the pectoral girdle characteristic of *Ornithostoma* (*Pteranodon*), e. g., *Ornithodesmus*, but the form of the skull, the position and shape of the several elements, the absence or presence, size, and position of the teeth, vary in the different genera, and are therefore the characters most to be trusted in classification. By such means the portions of skulls included in the Cambridge material under the genus *Ornithocheirus* naturally divide into five well-defined groups, and it is more than probable that they belong but to few species. The humeri and ulnæ may be arranged into three groups.

Further, Seeley\* was misled by a study of the German specimens in determining the ulna as the radius and the radius as the ulna, and therefore the wrong position of these bones in the antebrachium and their place of articulation with the proximal carpal, and in stating that the radius was the larger bone.

He was studying extremely fragmentary remains, and in the German specimens the bones are so crushed that the detailed structure of their articulations is nearly indecipherable.

We shall now proceed to denote the characters by which the fragments of snouts may be classified, and give the species which naturally group themselves under each. Many of the specimens are so close to one another—which is remarkable in itself, considering their fragmentary state—that the differences in detail, which are often trivial, are of little avail until future discoveries of more complete skulls exhibit otherwise. This, we are confident from a close study of these specimens, will not be the case, and it is strange that every specimen found should have belonged to a new species. The twenty-six type-specimens in the Sedgwick Museum have been described by Seeley or Owen; therefore it will not be necessary to do that again.

#### GROUP No. 1.

Beaks laterally compressed, moderate vertical depth, tip more or less obtuse, dorsal keels. Palate curving slightly upwards anteriorly, causing the front teeth to be directed forward. Longitudinal ridge on palate, teeth subcircular, alveolar rims rising above palate.

\* H. G. Seeley, 'Ornithosauria,' 1870, p. 42.

## Examples :—

- O. brachyrhinus* (Seeley). H. G. Seeley, 'Ornithosauria,' 1870, p. 123.  
*O. cuvieri* (Bowerbank). Fig. J. S. Bowerbank, Proc. Zool. Soc. 1851, p. 15, pl. iv. (lettered *longirostris*); and R. Owen, Rep. Cret. Form. (1851) tab. xxviii. figs. 1-4.  
*O. colorhinus* (Seeley). H. G. Seeley, 'Ornithosauria,' 1870, p. 124.  
*O. dentatus* (Seeley). H. G. Seeley, 'Ornithosauria,' 1870, p. 119.  
*O. denticulatus* (Seeley). H. G. Seeley, 'Ornithosauria,' 1870, p. 122, pl. xii. figs. 8, 9.  
*O. enchorhynchus* (Seeley). H. G. Seeley, 'Ornithosauria,' 1870, p. 123.  
*O. fittoni* (Owen). R. Owen, Rep. Cret. Form. (1859), Suppl. i. pl. i. figs. 3-5, and elsewhere.  
*O. nasutus* (Seeley). H. G. Seeley, 'Ornithosauria,' 1870, p. 120.  
*O. oxyrhinus* (Seeley). H. G. Seeley, 'Ornithosauria,' 1870, p. 117.  
*O. polyodon* (Seeley). H. G. Seeley, 'Ornithosauria,' 1870, p. 121.  
*O. sedgwicki* (Owen). R. Owen, Rep. Cret. Form. (1859), Suppl. i. pl. i. figs. 1, 2, and elsewhere.

These are the only specimens that truly come under Seeley's amended definition of the genus *Ornithocheirus*, viz. :—

- I. Teeth prolonged anterior to muzzle.
- II. Longitudinal ridge on palate.

To this group, therefore, should be assigned the generic name *Ornithocheirus*.

## GROUP No. 2.

Beaks lanceolate and pointed, compressed laterally and vertically near the tip. Little or no upward curving of the palate. Teeth considerably smaller than in *Ornithocheirus*, uniform in size, and more or less laterally compressed. Moderate rising of alveolar rim. Longitudinal ridge on palate.

## Examples :—

- O. compressirostris* (Owen). R. Owen, Rep. Cret. Form. (1851) pl. xxvii. fig. 5, and pl. xxviii. figs. 8, 9, 10.  
*O. machæorhynchus* (Seeley). H. G. Seeley, 'Ornithosauria,' 1870, pl. xii. figs. 1 & 2.  
*O. microdon* (Seeley). H. G. Seeley, 'Ornithosauria,' 1870, pl. xii. figs. 6, 7.  
*O. oweni* (Seeley). H. G. Seeley, 'Ornithosauria,' 1870, p. 115.  
*O. scaphorhynchus* (Seeley). H. G. Seeley, 'Ornithosauria,' 1870, p. 119.  
*O. tenuirostris* (Seeley). H. G. Seeley, 'Ornithosauria,' 1870, p. 114.

We suggest that this genus be called *Lonchodectes*.

## GROUP No. 3.

Beaks with strong lateral compression forming dorsal keel, triangular in section, truncated tip, moderate vertical depth. Dorsal outline rising from the tip at a high angle. Longitudinal ridge on palate as in *Ornithocheirus*. Very large circular teeth, anterior much larger than posterior, none directed forward.

Examples :—

- O. crassidens* (Seeley). H. G. Seeley, 'Ornithosauria,' 1870, p. 122.  
*O. eurygnathus* (Seeley). H. G. Seeley, 'Ornithosauria,' 1870, p. 123.  
*O. platysomus* (Seeley). H. G. Seeley, 'Ornithosauria,' 1870, p. 120.

To this genus we would give the name *Amblydectes*.

## GROUP No. 4.

Massive truncated club-shaped snout, great vertical depth, longitudinal ridge on palate, teeth subcircular and vertically directed, front pair much smaller than the rest.

Examples :—

- O. capito* (Seeley). H. G. Seeley, 'Ornithosauria,' 1870, p. 126.  
*O. carteri* (Seeley). H. G. Seeley, 'Ornithosauria,' 1870, p. 128.  
*O. platyrhinus* (Seeley). H. G. Seeley, 'Ornithosauria,' 1870, p. 128.  
*O. simus*. R. Owen, Rep. Cret. Form. (1861), Suppl. iii. pls. i. & ii.,  
 pl. iv. fig. 4.  
*O. woodwardi*. R. Owen, Rep. Cret. Form. (1861), Suppl. iii. pl. ii.  
 fig. 3.

For this group it would be well to give the generic name *Criorhynchus*, *Criorhynchus simus* being the type. R. Lydekker\* suggested that if it "should prove generically different from *Ornithocheirus* the name *Criorhynchus* might be retained for it." R. Owen, in 1861† and 1874‡, determined the type-specimen as belonging to the upper jaw, and Seeley in 1870§ remarked : "a re-examination of the type, *Pterodactylus simus*, Owen, has convinced me that it is a lower jaw." Afterwards, however (1881)||, he altered this view. We have a certain character to denote the upper and lower jaw in the presence of a longitudinal ridge on the palate on the former and a groove on the latter. As the ridge is to be

\* R. Lydekker, B. M. Cat. 1889, p. 3.

† R. Owen, Rep. Cret. Form. (Mon. Pal. Soc. 1861), Suppl. iii. p. 2.

‡ *Id. ibid.* pt. i. (1874) p. 6.

§ H. G. Seeley, 'Ornithosauria,' 1870, p. 127.

|| *Id.* Geol. Mag. [2] vol. viii. (1881) p. 15.

discerned\*, Seeley's first decision is the correct one, which coincides with Owen's. Moreover, if this be a lower jaw, and the usual proportion of a lower to an upper obtain, the depth of the tip of the muzzle would be so excessive that the supposition becomes highly improbable.

#### GROUP No. 5.

Beak lanceolate, compressed, pointed, edentulous.

Example:—

*Ornithostoma*. R. Owen, Rep. Cret. Form. (1859), Suppl. i. pl. iv. figs. 4 & 5; and H. G. Seeley, Ann. & Mag. Nat. Hist. (4) vol. vii. p. 35, footnote (1871), and elsewhere.

It will be useful now to review the specimens other than in the Sedgwick Museum included by authors in the genus *Ornithocheirus*, and allot them to their particular genus, as detailed above.

#### *Ornithocheirus clavirostris*, R. Owen.

Rep. Meso. Form. (1874) pt. i. p. 6, pl. i. figs. 1-4.

Wealden (Hastings Sand), St. Leonard's-on-Sea.

In regard to this specimen Owen † was loth to believe that the "pair of teeth so anomalously located" (above the palate) was due to anything but an accident. Seeley suspected that the bone would prove to be the dentary, but the presence of the palatal ridge determines it to be the premaxillary. Neither Owen nor Seeley apparently considered the great amount of attrition to which each of the specimens had been subjected. The variation in the section of the teeth appears purely accidental, according to the degree of wear the bone has undergone. From a careful examination of the type-specimen we are confident that *Ornithocheirus* (*Coloborhynchus*) *clavirostris* is a synonym of *O. simus* and *O. woodwardi*, that they are all premaxillary bones, and that the position of the teeth, which would indeed be anomalous above the palate, is to be explained very simply: the wearing away of the tip of the snout has exposed the bases of these teeth, and not the foot of their crowns near the alveoli, as shown by the restoration (Pl. XXII. fig. 5). A similar worn condition of the sides of this specimen has displayed the bases of the teeth here also. Thus it becomes in all respects similar to *O. simus*

\* R. Owen, Rep. Cret. Form. (Mon. Pal. Soc. 1861), Suppl. iii. tab. i. fig. 5.

† *Id. ibid.* (Mon. Pal. Soc. 1874) pt. i. p. 7.

(Pl. XXII. fig. 4), and therefore in future should be known as a synonym of *Criorhynchus simus*, and naturally falling into Group no. 4 as above.

*Ornithocheirus daviesii* (Owen).

Rep. Meso. Form. (Pal. Soc. 1874) pt. i. p. 2, pl. i. figs. 5 & 6.

The form and size of the teeth and the lanceolate shape of this dentary bone prove it to belong to Group no. 2.

*Ornithocheirus giganteus* (Bowerbank).

Quart. Journ. Geol. Soc. vol. ii. (1846) p. 8, pl. i., and elsewhere.

The tip of the muzzle of both the upper and lower jaw.

We are convinced that its conical shape has been produced by vertical expansion due to pressure, and possibly its width proceeds from the same cause. Taking this into consideration, and also the type of the teeth, which are strongly characteristic, this species can be included within Group no. 2.

*Ornithocheirus reedi* (Seeley).

Geol. Mag. [2] vol. viii. (1881) p. 13, pl. i. fig. 3.

Seeley\* says this species "closely resembles *Ornithocheirus capito*"; therefore it comes into Group no. 4.

*Ornithocheirus sagittirostris* (Owen).

Rep. Meso. Form. (Mon. Pal. Soc. 1874) pt. i. p. 3, pl. ii.

These mandibular rami from the Wealden, by the angle of their convergence towards the symphysis, and the form, size, and arrangement of the teeth belong to Group no. 2.

*Ornithocheirus xyphorhynchus* (Seeley).

'Ornithosauria,' p. 117; and Geol. Mag. [2] vol. viii. (1881) p. 18, pl. i. fig. 2.

In the former paper Seeley determined this fragment to be a part of a premaxillary, in the latter of a dentary. It is very close to *Ornithocheirus sedgwicki*, and should therefore be included in Group no. 1.

\* H. G. Seeley, 'Ornithosauria,' 1870, p. 127.

*Ornithocheirus clifti* (Mantell). Portions of humerus.

'Medals of Creation,' vol. ii. (1844) p. 806, woodcut 149.

*Ornithocheirus curtus* (Owen). Distal end of tibia.

Rep. Lias Form. (Mon. Pal. Soc. 1870) pt. ii. p. 52, pl. xix. figs. 8, 9.

*Ornithocheirus diomedius* (Owen). Distal end of ulnar metacarpal.

Brit. Foss. Mam. and Birds (1846), p. 545, woodcut 230.

*Ornithocheirus nobilis* (Owen). Portion of wing-phalange,  
? ulna.

Rep. Lias Form. (Mon. Pal. Soc. 1870) pt. ii. descr. to pl. xix. fig. 10.

These species, founded on fragments of bones, must for the present remain in the genus *Ornithocheirus*, but for no other reason than that they have been placed there, for the characters of the bones belonging to the genus *Ornithocheirus* are absolutely unknown.

### *The Vertebral Column.*

In regard to the bones of the vertebral column, there is not much in the Cambridge Greensand specimens, by reason of their fragmentary and worn condition and their non-association with parts known to belong to given species, to help one in classification. Some of the cervicals are fairly perfect. Seeley \* denotes two groups:—

- (I.) Narrow neural arch with high neural spine, pneumatic foramen oblique. Ventral face of centrum oblong and flattened.

He gives as example that figured by Owen † as belonging to *Pterodactylus simus*.

- (II.) Wide neural arch, pneumatic foramen horizontal. Side of centrum makes a right angle with the base (p. 68). Ventral surface convex.

Example given, *Pterodactylus simus* (Owen) ‡.

\* H. G. Seeley, 'Ornithosauria,' 1870, p. 66.

† R. Owen, Rep. Cret. Form. (Mon. Pal. Soc. 1861), Suppl. iii. pl. ii. fig. 4.

‡ *Id. ibid.* (Mon. Pal. Soc. 1859), Suppl. i. pl. ii. fig. 1.

*Dorsal Vertebrae.*

Seeley \* classifies these vertebrae into two groups by the same characteristics. He gives as examples those figured by Owen † in his memoir on *Pterodactylus sedgwicki*. There is no justification for Owen assigning either the cervical to *P. sinus* or the dorsal to *P. sedgwicki*, nor for Seeley the flat cervicals to *Ornithocheirus*. The characters pertaining to any particular genus cannot yet be definitely given.

*The Notarium.*

Bones which in Ornithosauria were included in the sacrum and the os innominatum, and numbered and figured respectively

|              |                |           |             |
|--------------|----------------|-----------|-------------|
| J. c. 4, 1.  | Ornithosauria. | Pl. x.    | Figs. 8, 9. |
| J. b. 10, 3. | do.            | Pl. viii. | Fig. 3.     |

by the discovery of the blending of the early dorsal vertebrae into the so-called notarium of the American form *Pteranodon*, were found to belong to this portion of the axial skeleton. Owen ‡ described and figured a bone from the Cambridge Greensand which belongs to the notarium as “probably frontal.” The specimen J. c. 4, 1 was figured in the restoration of the pectoral girdle by Seeley in 1891 § and 1901 ||. Both of these differ in detail from the original vertebra which is figured in Ornithosauria. Prof. Williston ¶ has pointed out that the vertebra of these figures is “undoubtedly wrong.”

It would, perhaps, be safe to assign to *Ornithostoma* all the specimens belonging to the notarium, because we have the American evidence of its obtaining in *Ornithostoma* (*Pteranodon*), while there is none as regards the dentigerous jaws from Cambridge.

*The Sacrum.*

The six specimens of sacral vertebrae are so destroyed that it is impossible to say whether the transverse ribs were ankylosed at their distal extremities as in *Ornithostoma* (*Pteranodon*). Nos. 1 and 2 have the ventral surface of the

\* H. G. Seeley, ‘Ornithosauria,’ 1870, p. 69.

† R. Owen, Rep. Cret. Form. (Mon. Pal. Soc. 1859), Suppl. i. pl. ii. figs. 20 & 23, and figs. 24 & 25.

‡ *Id. ibid.* p. 12, pl. iv. figs. 6-8.

§ H. G. Seeley, Ann. & Mag. Nat. Hist. (6) vol. vii. p. 441, fig. 2 (1891).

|| *Id.* ‘Dragons of the Air,’ 1901, p. 115.

¶ S. W. Williston, Kansas Univ. Quart. 1897, p. 44.



centrums flat and 3 to 7 convex. In specimen *J. c.* 4, 3, which consists of three vertebræ, the bases of two transverse ribs are preserved.

### *The Caudal Vertebræ.*

The examples determined as caudal vertebræ by Seeley in 'Ornithosauria' he later\* believed to be cervicals. Some are doubtless centrums of cervicals. The absence of transverse processes and their amphiplatyan nature bring them close to *Ornithostoma* (*Pteranodon*).

### *The Scapula and Coracoid.*

These bones may be separated into two groups. One of these, typified by specimens *J. a.* 3, was figured by Owen †. This example is very interesting, because it exhibits on the inner side of the scapular arch the bar of bone bracing the scapula and coracoid, and enclosing a foramen similar to that mentioned by Prof. Williston ‡ as found in *Ornithostoma* (*Pteranodon*) and *Nyctosaurus*. There would not seem to be further proof required that this type of scapula-coracoid belongs to the toothless English genus *Ornithostoma*. The coraco-scapular suture is oblique to the long axis of the glenoid cavity. The head of the coracoid is not so globular as that typified by *J. c.* 4, 18, 6. This specimen, figured by Seeley §, is characterized by the absence of the bar of bone, interior to the anchylosed humeral extremities of these bones. Both these two types are easily differentiated from *Ornithodesmus latidens* by the diagonal direction of the line of ankylosis of the scapula with the coracoid across the glenoid articulation, which in the latter is horizontal. The type, *J. c.* 4, 18, 6, is very nearly similar in form to the latter, and both are alike in the non-presence of the inner bar of bone.

### *The Humerus.*

Seeley || mentions fifty specimens of this bone. *J. a.* 8, 1 may be dismissed as useless. It is part of a large limb-bone, from its size more probably Dinosaurian, for it is

\* H. G. Seeley, Quart. Journ. Geol. Soc. 1875.

† R. Owen, Cret. Form. Rep. (Mon. Pal. Soc. 1859), Suppl. i. p. 111, fig. 1.

‡ S. W. Williston, Kansas Univ. Quart. 1897, p. 43; and Field Col. Mus. Pub. 78, geo. ser. vol. iii. no. 3, pp. 140-141.

§ H. G. Seeley, 'Ornithosauria,' 1870, pl. i. fig. 10.

|| *Id. ibid.* p. 38.

## PROXIMAL ENDS OF HUMERI.

| GROUP A.  | GROUP B.  | GROUP C.   |
|---|---|--|
| <ol style="list-style-type: none"> <li>1. Deltoid crest strongly developed, set at right angles to the long axis of proximal condyle, with the lower half of its distal extremity directed towards the shaft of the bone.</li> <li>2. Ulnar crest moderately developed.</li> <li>3. Pneumatic foramen under ulnar crest, dorsal surface, near the articulation.</li> <li>4. Proximal condyle strongly arched over dorsal surface.</li> <li>5. Articular surface of condyle perfectly smooth, no ridge present.</li> <li>6. Proximal condyle very crescentic.</li> <li>7. Proximal ventral surface of shaft very concave.</li> </ol> <p>Examples: nos. 14, 25, 26.</p> <p>Type, J. a. 6, 25.</p> | <ol style="list-style-type: none"> <li>1. Deltoid crest not preserved; it had its origin further down the shaft than either Group A or C, and apparently slightly oblique to the long axis of the proximal condyle.</li> <li>2. Ulnar crest strongly developed.</li> <li>3. Pneumatic foramen under ulnar crest, dorsal surface, further from articulation than Group A.</li> <li>4. Proximal condyle feebly arched over dorsal surface.</li> <li>5. Articular surface of condyle with transverse ridge, preaxial side.</li> <li>6. Proximal condyle feebly crescentic, horns splaying outwards.</li> <li>7. Proximal ventral surface flat.</li> </ol> <p>Examples: nos. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 16, 17, 18, 19.</p> | <ol style="list-style-type: none"> <li>1. Deltoid crest strongly developed and produced obliquely to the long axis of the proximal condyle. No curve of distal extremity to the shaft.</li> <li>2. Ulnar crest strongly developed.</li> <li>3. Pneumatic foramen on the ventral surface, situated medianly, very near the articulation.</li> <li>4. Proximal condyle moderately arched over dorsal surface.</li> <li>5. Articular surface of condyle smooth, no ridge present.</li> <li>6. Proximal condyle moderately crescentic.</li> <li>7. Proximal ventral surface feebly concave.</li> </ol> <p>Examples: nos. 22, 23, 24, 27, 28, 30.</p> <p>Type, J. a. 6, 30.</p> |

## DISTAL ENDS OF HUMERI.

| GROUP A.  | GROUP B.   | GROUP C.  |
|---|--|---|
| <p>1. Condyle, preaxial side, dorsal half slightly convex for the ulna, on the ventral half a weak trochlea for the radius. No median convexity.</p> <p>2. Circular opening into bone.</p> <p>3. Articular facet as seen in Groups B and C not present.</p> <p>4. Ulnar tubercle very robust, entirely on preaxial border.</p> <p>5. Two ridges, one on preaxial, the other on postaxial, border of ventral surface of shaft.</p> <p>6. Deep transverse valley from ulnar tubercle to central opening into the shaft.</p> <p>Examples: nos. 21, 31, 32.</p> | <p>1. Condyle preaxial side, with two nearly flat oblique surfaces, the dorsal for the ulna looking distally, the ventral for the radius looking ventrally.</p> <p>2. Circular opening into bone.</p> <p>3. Concave oval articular facet, postaxial side, slightly oblique.</p> <p>4. Ulnar tubercle very robust, entirely on ventral border.</p> <p>5. As in Group A.</p> <p>6. Absent.</p> <p>Examples: nos. 20, 29, 33, 34, 35.</p> | <p>1. A preaxial and median convex condyle, a concavity between them forming a true trochlea for the ulna. An articular facet for radius on the inner surfaces of the horns of the crescentic distal end.</p> <p>2. No opening into the bone.</p> <p>3. Concave oval articular facet, postaxial side, looking outwards.</p> <p>4. Ulnar tubercle weak, entirely on ventral border.</p> <p>5. Ridge on preaxial border of ventral surface of the shaft only.</p> <p>6. Absent.</p> <p>Examples: nos. 30, 36, 37, 42, 43, 44, 45, 46.</p> |

apparently from the central area of the shaft, where the bone is smallest in Pterodactyls. The complete bone would therefore be of enormous bulk, and, with the other bones of the skeleton in proportion, we should have a reptile too heavy for flight. Moreover, it reveals no constriction as seen in the Pterodactyl humerus. Whether we take the proximal or distal ends, the forty-nine specimens naturally form three groups. In one group the entire bone is known for certain by the perfect example J. a. 6, 30, and by comparison with *Ornithodesmus latidens* another is nearly as sure, and there is reason to believe that the third group is comprised of those proximal ends which are different from the other two groups, although there can be no positive determination until a perfect humerus with the same characters is discovered. We give on pp. 542-543 the characters of the three groups and their examples, and follow by a criticism of some of the specimens included in the groups:—

#### Proximal ends.

##### GROUP A.

Seeley\* gives J. a. 6, 25 as an example of the same kind of proximal end as seen in the perfect humerus, J. a. 6, 30, "having the pneumatic foramen radially situated on the anterior aspect near the articular surface." The pneumatic foramen is, however, found on the postaxial side posterior surface as a small circular hole in an oval-shaped depression. On its distal margin it is worn away, but the foramen can be well determined. In J. a. 6, 30 the deltoid crest is produced obliquely to the long axis of the condyle, while in J. a. 6, 25 it is nearly a right angle with little or no curve until its termination contiguous to the preaxial border of the shaft. In J. a. 6, 25 the outer surface of the deltoid crest is flat. As the crescent-shaped condyle in this specimen has a greater curve than that of the other examples in this or the remaining groups, a greater convexity is found on the dorsal and a greater concavity on the ventral margin. J. a. 6, 26 approaches closely in character to J. a. 6, 25; but, although the crest is carried as far down the shaft as in that specimen, it is produced more obliquely to the long axis of the condyle, recalling J. a. 6, 30 (Group C) in that respect only.

\* 'Ornithosauria,' 1870, p. 39.

## GROUP B.

J. a. 6, 4. Proximal end of right humerus. The deltoid crest has its origin far below the condyle, and is apparently slightly oblique to its long axis. The pneumatic foramen is further down the shaft than in J. a. 6, 26 (Group A), and there is a ridge on the preaxial moiety of the condyle. The condyle is not so crescentic, and therefore the horns splay more outwards and the ulnar crest is moderately developed.

## GROUP C.

The perfect humerus J. a. 6, 30, whose characters have been given by Seeley, is the type. J. a. 6, 22, 23, 24, 27, 28 are proximal ends exhibiting pneumatic foraminæ on the ventral surface, and 38, 39, 40, 41 should also apparently have been included, although they are too much abraded to reveal the pneumatic foramen.

## Distal ends.

## GROUP A.

J. a. 6, 21 & 32. Examples belonging to left humeri. They are similar to *Ornithodesmus latidens*, though one-fifth smaller in the transverse diameter of the distal articulation, and the characters are very weakly developed. The central circular cavity and the transverse valley in no. 32 are filled with phosphate of lime, and thus are not well seen, while in No. 31 these are obscured by the bone being much worn in this region and destroyed on the dorsal margin of the median pit. The ulnar articulation on each bone is also worn, and does not appear to have been as highly developed as in *Ornithodesmus latidens*. Seeley says\* that the "mesial condyle in this group appears in every case to be an epiphysis which is wanting." The narrow ridge on the proximal end of the ulna requires a valley to articulate in, and this would be impossible if a mesial condyle had been present.

J. a. 6, 31. This example possesses the same characters as nos. 21 and 32, although in a very incipient stage. It is interesting because the central circular entrance into the bone is not present. In that region occurs a basin-shaped hollow only.

\* H. G. Seeley, 'Ornithosauria,' 1870, p. 40.

## GROUP B.

J. a. 6, 35. This example was figured by Owen \* and also by Seeley †. It differs from *Ornithodesmus latidens* in the circular pit on the articular surface being postaxial, while in the Atherfield specimen it is nearer the preaxial. The pre-axial or radial area of the Cambridge specimens, as described by Owen ‡, "shows a slightly convex surface occupying its major part, and a small well-defined flat surface placed obliquely." The "slightly convex surface" becomes more convex ventrally as it nears the flat oblique surface. With a part of the former and the whole of the latter the radius articulated; but the dorsal moiety of the "slightly convex surface" was a portion of the ulnar articulation, which is continued round the dorsal margin to the postaxial edge (ulnar side), where it becomes an oval concave surface. The ulnar tubercle is placed on the ventral border only, and not on the postaxial, as in *Ornithodesmus latidens*. By nos. 20, 29, 33, and 34 it is seen that in this group there is no transverse valley, but that the ulna apparently occupied the whole of the transverse diameter of the articular end.

## GROUP C.

The most perfect distal end of this group is J. a. 6, 36. It is crescentic, with the convexity on the dorsal side. The articulation exhibits a radial and median convexity, with a depression between them, forming a trochlea. On the ventral margin of the postaxial side there is a tubercle directed distally, and dorsal to this an oval concave facet, obliquely placed and looking outwards. On the ventral surface, between the horns of the crescent, there is a deep concavity, and, as the radial and ulnar condyle both have a flat facet looking inwards, it is probable that the radius articulated with both these.

The type of ulna shown on tablet J. a. 9, no. 1, we believe to belong to this group, because of its similar articular surfaces.

It is highly probable that the proximal ends of Groups A,

\* R. Owen, Rep. Cret. Form. (Mon. Pal. Soc. 1851), Suppl. i. pl. iv. figs. 1-3.

† H. G. Seeley, 'Ornithosauria,' 1870, pl. iv. fig. 14.

‡ R. Owen, *loc. cit.* p. 16.

B, C will be found to belong to the distal ends of Groups A, B, C as now classified. That Group A belongs to a genus of the family Ornithodesmidae appears to be certain by a comparison with the humerus of *Ornithodesmus latidens*, and from Prof. Williston's\* description of the distal end of the humerus of *Ornithostoma* (*Pteranodon*) we consider the distal ends of Group B to belong to that genus, and therefore to the edentulous forms of the Cambridge Greensand. Whether the proximal ends of this group are rightly apportioned is a more difficult matter to determine, for the base is all that remains of the deltoid crest, the most characteristic feature. On examination of these specimens it appears that it was oblique to the long axis of the condyle, which, as far as it goes, agrees with Prof. Williston's † description of the crest in *Ornithostoma* (*Pteranodon*). "This process, the radial or deltoid, has its convex rounded extremity directed obliquely forward and upward and outward," yet at the same time it resembles, perhaps in a greater degree, his account of *Nyctosaurus* ‡, "the deltoid, radial, or lateral process very large." "It is directed forward and a little downward." He also says, "The ulnar or median process is very stout." This, together with the fact that the crest is more distal to the condyle in *Nyctosaurus*, seems to favour a greater affinity to *Nyctosaurus* than to the proximal ends in Group B (? *Ornithostoma*). Thus, he remarks §, "This crest is further removed from the head of the bone than is the case in species of *Pteranodon*." Perhaps with the details now given for this group an examination of the American specimens would enable a decision. At any rate, they do not belong to Groups A or C, and thus in all probability pertain to the edentulous forms. In regard to Group C, typified by the perfect humerus J. a. 6, 30, there is not even a suggestion to be obtained from known facts as to which, if any, of the remaining genera, formed on the evidence of the premaxillæ, it belongs.

### *Radius and Ulna.*

The specimens on tablet J. a. 9 are the proximal ends of .

\* S. W. Williston, "Restoration of *Ornithostoma*," Kansas Univ. Quart. 1897, p. 45.

† S. W. Williston, *ibid.* p. 44.

‡ *Id.* Field Col. Mus. Pub. 78, geo. ser. vol. ii. no. 3, p. 141.

§ *Id.* Kansas Univ. Quart. vol. i. 1892-3, p. 6.

ulnæ. Corrections must be made on all the other tablets, as well as in the letterpress and figures of 'Ornithosauria':—

*Tablets.*

- J. a. 10\*. Distal ends of ulnæ, *not* "radii."  
 J. a. 11. Proximal ends of ulnæ, *not* "radii."  
 J. a. 12. Distal ends of radii, *not* "ulnæ."  
 J. a. 13. Proximal ends of radii, *not* "ulnæ."

*Letterpress and titles, 'Ornithosauria.'*

- P. 43, *for* I. Distal end of "Ulna," *read* Radius.  
 P. 44, "Nos. 5 and 6 on another tablet (? tablet J. a. 13) appear to be distal ends of ulna." *For* "ulna" *read* radius.  
 P. 44, *for* II. Distal End of "Radius," *read* Ulna.  
 P. 46, *for* IV. Proximal End of "Radius," *read* Ulna.

*Figures.*

- Plate II. Figs. 7, 8, & 9. Proximal ends of right ulna, *not* "radius."  
 Plate III. Fig. 1. Ventral view of distal end of left ulna, *not* "radius."  
 Fig. 2. Dorsal view of distal end of left ulna, *not* "right radius."  
 Fig. 3. Distal articulation of left ulna, *not* "right radius."  
 Fig. 10. Distal end of right radius, *not* "ulna."  
 Fig. 12. Distal end of left radius, *not* "ulna."  
 Plate XI. Fig. 7. Specimen J. c. 9, *for* "palatal aspect of the basisphenoid bone" *read* "upper portion of occiput"; the figure is upside down.  
 Fig. 8. Specimen J. c. 9, *for* "ethmo-sphenoid mass" *read* left lateral view of posterior moiety of skull of *Ornithostoma*.  
 Fig. 9. Specimen J. c. 9, *for* "posterior aspect of same specimen" *read* "anterior aspect"; the "cups" are the posterior boundaries of the orbits.

*Radius.*

There are only three specimens of the proximal end of the radius and four of the distal, and these are so close in characters that they may be included in one group.

*Proximal end.*

1. Dorsal surface convex, ventral concave.
2. Preaxial border produced outwards and forwards, the postaxial straight.
3. Articular surface, preaxial side, convex looking outwards; postaxial concave looking proximally.
4. Moderately compressed dorso-ventrally, width pre-postaxially apparently maintained down the shaft.

\* There are eleven examples on this tablet, the eleventh perhaps attached since 'Ornithosauria' was written.



## Distal end.

1. Dorsal and ventral surface slightly convex.
2. Articular surface a convex roll, compressed more or less dorso-ventrally, in the median area.
3. Preaxial border flat.

In regard to the proximal extremities affixed to tablet J. a. 13\*, specimens 5 and 6 belong to the same species as far as can be ascertained. No. 6 is not well preserved. An unnumbered specimen is near to 5 and 6, with the articular features less prominent. The main difference between these bones and those of *Ornithodesmus latidens* lies in the latter being flatter and rapidly lessening in size down the shaft. The former are stouter and reveal little or no decrease distally. Between the two surfaces of the articular end of *Ornithodesmus latidens* there is a transverse ridge across the short diameter of the bone, which fits into the valley between the two condyles of the trochlea of the humerus. This is not seen in the Cambridge specimens; therefore they probably do not belong to distal ends of the humeri J. a. 6, 21 and 32, Group A, where a feeble incipient trochlea is to be observed, but to Group B.

Of the four specimens of the distal ends of the radius, J. a. 12, 1-4, not one belongs to the same genus as *Ornithodesmus latidens*, for, although there is a general similarity in form, they differ in details. The dorsal and ventral surfaces of *Ornithodesmus latidens* are flatter and more compressed than any of the Cambridge specimens. The ventral surfaces of nos. 1 and 3 are more concave. In all four specimens, including *O. latidens*, the articular surface is a complete convexity from the pre- to the postaxial border, and all exhibit more or less constriction of this convexity on both dorsal and ventral borders in the median region. Nos. 1 and 3 belong to the same species. The preaxial border is not flattened in *O. latidens* as in the Cambridge specimens, but is robust and convex. The bone is much more concave near the articulation on the ventral surface, preaxial side. There is a longitudinal groove for muscle-attachment, contiguous with the postaxial border on the ventral surface, which is not seen in the Cambridge specimens. In *O. latidens* on the postaxial side of the dorsal surface there is a well-developed ridge and striæ, caused by the fibres of the muscles traversing the bone

\* There is an unnumbered specimen on this tablet.

diagonally from the preaxial distal border. This is not exhibited in the Cambridge examples. The specimen no. 2 is not as compressed as nos. 1 and 3, or as *Ornithodesmus latidens*, and the dorsal surface is more concave distally.

### *The Ulna.*

#### Proximal end.

The six specimens on tablet J. a. 9 are the proximal ends of ulnæ. Nos. 1, 2, 4, and 5 are figured in 'Ornithosauria,' plate iii. figs. 4, 5, 6, 7, 8, 9. J. a. 9, 1, belonging to the left ulna, differs from *Ornithodesmus latidens* in the absence of the longitudinal ridge on the ventral surface of the shaft, in lieu of which there is a raised and roughened surface, preaxial to the radius instead of postaxial, for the attachment of the biceps tendon. This feature is also seen in nos. 2 and 4. The dorsal surface is strongly convex, and the ventral slightly, and free from any pit or ridge. The pneumatic foramen is near the articulation in the centre of the ventral surface. The articulation is much worn. This specimen is interesting, because from it Seeley obtained the suggestion of an olecranon\*. There is a well-defined line around the upper dorsal half, which might be accidental. The surfaces in all the other examples appear to be articulatory, and the roughened edges the effect of wear, and not caused by the tearing away of an epiphysis. The main articulatory surface is an oblique oval-shaped basin, looking upwards, in the centre of which in specimens nos. 4, 5, and 6 is a circular opening into the shaft, as is seen in the humerus of *Ornithodesmus latidens* and in J. a. 6, nos. 20, 21, and 32. Moreover, the general form of the bone is not very different from the distal extremities of the humeri, exhibiting the circular opening into the shaft—for example, J. a. 6, 20. In those examples where the supposed olecranon has come away the dorsal half of the articulatory surface is concave. It looks upwards and is divided from the ventral half by a convex ridge. The ventral surface looks downwards and is feebly convex dorso-ventrally and concave pre-postaxially. In no. 1 the articulation has two feebly concave surfaces, with a raised ridge for the trochlea of the distal end of the humerus. In no. 2 the dorsal half of the articulation is destroyed. The postaxial concave surface is more oblique and carried further on to the shaft of the bone, thus looking more outward than in the other specimens. This example

\* H. G. Seeley, 'Ornithosauria,' 1870, pp. 45 & 46.

exhibits the raised and roughened surface for the biceps tendon in a greater degree than any of the others on this tablet.

Tablet J. *a.* 11. The seven specimens on this tablet are the proximal ends of ulnæ. No. 1 is the proximal end of a right ulna figured by Seeley, pl. ii. fig. 8 (*loc. cit.*), as the proximal end of radius. It is much smaller, but similar to *Ornithodesmus latidens*, with the central transverse ridge on the articular surface not so highly developed. This ridge and the margins of the bone on the postaxial side are worn away. The strong longitudinal ridge on the centre of the ventral surface of the shaft is also destroyed, but its base is well seen. A pneumatic foramen occurs, covered by a small daub of matrix, near the articular surface, ventral side, as in *Ornithodesmus latidens*.

Nos. 2, 3, 4, 5, 6 all have the median vertical ridge on the anterior surface of the shaft. All are close to no. 1, and thus near to *Ornithodesmus*, but the ridges, processes, and articular characters are either in an incipient or degraded state. No. 5 has lost the median area of the articulation in such a manner that it appears at first sight to be a basin-shaped depression, whereas a closer examination proves that it is due to wear. The pneumatic foramen is not seen in nos. 2-6, for the same reason.

No. 7, the proximal end of the right ulna, figured by Seeley, pl. ii. fig. 7 (*loc. cit.*), is remarkably different from the other six examples on this tablet. The only articular surface preserved is on the preaxial side. It is slightly convex and looks anteriorly. The dorsal surface and postaxial border are destroyed. There is no pneumatic foramen on the portion preserved. The great peculiarity of this specimen is on the ventral surface, where the bone is concave, with an elongated and deep pit (no foramen) for the biceps tendon near the postaxial border. This is well seen in the figure. The other pits observed are not natural, but the borings of some organism.

#### Distal end.

Tablet J. *a.* 10, 1-10. There are eleven examples on this tablet, the eleventh probably added since 'Ornithosauria' was published. They are the distal ends of ulnæ, and not "radii." Nos. 1, 2, and 9 are similar in character, no. 2 is the best specimen and figured by Seeley, pl. iii. fig. 1 (*loc. cit.*). On the major portion of the dorsal surface, towards the preaxial side, there is the flattened surface, against which

## PROXIMAL ENDS OF ULNÆ.

| GROUP A.   | GROUP B.  | GROUP C.   | GROUP D.   |
|--|---|--|--|
| <p>1. Articular surface, preaxial side, feebly convex. A robust &lt;-shaped ridge centre of postaxial side, the branches produced to dorsal and ventral borders.</p> <p>2. Pneumatic foramen ventral surface.</p> <p>3. Robust longitudinal ridge, ventral surface near postaxial border moderate distance below articulation.</p> <p>4. Biceps tendon attached preaxial side of this ridge, postaxial to the radius.</p> <p>Examples: J. a. 11, 1, 2, 3, 4, 5, and 6.</p> | <p>1. Articular surface dorsal half concave, with a circular pit into the shaft.</p> <p>2. Pneumatic foramen ventral surface.</p> <p>3. Longitudinal ridge as seen in Group A absent.</p> <p>4. A small raised surface preaxial to radius for biceps tendon.</p> <p>Examples: J. a. 9, 2, 3, 4, 5, and 6.</p> | <p>1. Articular surface dorsal side produced proximally (the epiphysis of Seeley); ventral side, two slightly concave surfaces obliquely placed for trochlear jointed humerus. No pit into shaft.</p> <p>2. Pneumatic foramen ventral surface.</p> <p>3. Longitudinal ridge absent as in Group B.</p> <p>4. As in Group B.</p> <p>Example: J. a. 9, 1.</p> | <p>1. Articular surface, preaxial side slightly convex, looking anteriorly, postaxial side unknown.</p> <p>2. Position of pneumatic foramen unknown.</p> <p>3. Longitudinal ridge absent as in Groups B and C.</p> <p>4. A deep elongated pit for biceps tendon; ventral surface near the postaxial border and postaxial to radius. The raised surface as in Groups B and C absent.</p> <p>Example: J. a. 11, 7.</p> |

## DISTAL ENDS OF ULNÆ.

| GROUP A.  | GROUP B.   | GROUP C.  |
|---|--|---|
| <ol style="list-style-type: none"> <li>1. Dorsal surface flat. Incipient longitudinal ridge preaxial side. Dorsal surface becoming gently convex proximally.</li> <li>2. Ventral surface very inflated.</li> <li>3. Basin-shaped pit on articular surface near preaxial border.</li> <li>4. Articular facet postaxial side, prolonged on to the ventral surface.</li> <li>5. Elevated oblique flattened surface for muscle-attachment postaxial side of dorsal surface.</li> <li>6. Preaxial border angular.</li> <li>7. Articulation very inflated.</li> </ol> <p>Examples: J. a. 10, 1, 2, 9.</p> | <ol style="list-style-type: none"> <li>1. Dorsal surface more concave, the longitudinal ridge more developed, and the proximal dorsal surface flatter than in Group A.</li> <li>2. Ventral surface flat.</li> <li>3. As in Group A.</li> <li>4. As in Group A.</li> <li>5. As in Group A.</li> <li>6. As in Group A.</li> <li>7. Articulation preaxial side angular, caused by convergence of the flat dorsal and ventral surface.</li> </ol> <p>Examples: J. a. 10, 3, 4, 7, 8, 11.</p> | <ol style="list-style-type: none"> <li>1. Dorsal surface slightly concave and longitudinal ridge moderately developed.</li> <li>2. Ventral surface very inflated.</li> <li>3. As in Groups A and B.</li> <li>4. As in Groups A and B.</li> <li>5. As in Groups A and B.</li> <li>6. Preaxial border not as angular as Groups A and B.</li> <li>7. Articulation preaxial side not so inflated as Group A, or as compressed and angular as Group B.</li> </ol> <p>Examples: J. a. 10, 5, 6, 10.</p> |

the radius rested, bordered postaxially by the longitudinal ridge. The ventral surface is strongly convex. On the articulation there is clearly visible, although filled with matrix, the circular pit near the preaxial border, for the hemispherical knob of the proximal carpal, and at the post-axial edge on the ventral surface are seen the remains of the facet for articulation with the produced border of the carpal. Distally no. 2 is very much inflated.

J. a. 10, 3: the distal end of left ulna. The surface for the radius is more concave and the ridge more developed than in no. 1. The dorsal surface becomes flatter proximally, while in nos. 1, 2, and 9 it is gently convex. The distal extremity of this example differs considerably from no. 1; instead of being strongly inflated, both dorsal and ventral surfaces are flat, converging and forming an angle on the preaxial border. Nos. 4, 7, 8, and 11 are examples of this type. J. a. 10, 6, the distal end of left ulna, has a very inflated convex ventral surface, continued to the articulation. The longitudinal ridge is moderately developed. The dorsal articular surface for the radius is slightly concave. The preaxial side of the articulation is not as inflated as no. 1 nor as compressed and angular as no. 3. Nos. 5 and 10 are examples of this type.

No pneumatic foramina are to be found on any of these specimens.

*Conclusions as to the Extremities of Ulnæ* (see pp. 552-553).

By a comparison of the articulatory surfaces of J. a. 11, 1, 2, 3, 4, 5, and 6, it is quite possible that they belong to species with the same type of the distal end of humerus as nos. 21 and 32 on tablet J. a. 6, and therefore of Group A. Granting that the proximal ends, J. a. 9, 2, 3, 4, 5, and 6, Group B, have lost no epiphysis, and are as they were in life, we consider them to belong to the same reptiles, possessing the type of humerus exemplified in the distal end of humerus J. a. 6, 20, Group B, and thus, if our conclusions are correct, to *Ornithostoma*.

The only distal ends of humeri that J. a. 9, 1, Group C, could in any way articulate with are those of the Group C, of which the humerus J. a. 6, 30 is the type. The proximal end of the ulna J. a. 11, 7 must for the present remain an isolated bone, necessitating the formation of Group D, of which it is the only example.

There is no evidence available to enable the apportionment of any of the distal ends to either of the genera formed by

the premaxillæ. Group A certainly approaches *Ornithodesmus latidens*, but differs considerably in the great inflation of the ventral surface, the depth of the preaxial border, the lack of any drawing in of its distal termination into a tubercle, and no prolongation of the dorsal surface of the bone over the preaxial border as a wing. The longitudinal ridge on the dorsal surface is not as highly developed. The ventral surface of *Ornithodesmus latidens* is deeply concave, especially towards the postaxial border, before the rise of the bone for the articular facet, where, in the Cambridge specimen, the convexity is the greatest, and the articular facet on the postaxial side is more oblique.

### *The Carpals.*

It is impossible to assign any of these bones to any given genus, but two which have been figured by Seeley in 'Ornithosauria' are sufficiently close to *Ornithodesmus latidens* to favour an assumption that they belong to a genus with the humerus of the type of Group A. These bones are J. b. 1, no. 7, pl. v. fig. 3, a proximal belonging to the right carpus, and J. b. 3, 24, pl. v. fig. 7, to the right distal carpal.

### *The Wing Metacarpal.*

As with the other bones, only fragments of the wing metacarpal occur, and therefore comparisons with other genera from the length cannot be made. The best-preserved proximal end is J. b. 5, 3, figured by Seeley (pl. vi. figs. 2 & 3). It appears to belong to an entirely different family from *Ornithodesmus*.

Several specimens possess the facet, below the main proximal articulation, for the bending of the wing; but they are not as developed or directed outwards in as great a degree as in *Ornithodesmus latidens*.

### *The Sternum.*

The anterior projecting process is the only part of the sternum preserved. It was directed well forward, downward, and oblique to the sternal plate, and not vertical as in *Ornithodesmus latidens*. They are all close to *Ornithostoma* (*Pteranodon*) and *Nyctosaurus*, but they cannot be appor-tioned either to the dentigerous or edentulous forms of the Cambridge Greensand for certainty.

*Os innominatum.*

Examples of the ossa innominata are arranged on tablet J. b. 10, and numbered 1-9. In those specimens, where the acetabulum is preserved, it is imperforate, and the surrounding bones ankylosed and apparently near to *Ornithostoma* (*Pteranodon*) *ingens*, where the bones are conjoined and the acetabulum shallow and imperforate.

*Femur.*

There is only one perfect specimen of the femur, the other examples are fragments. They may be divided into two groups:—

- (1) Neck and head oblique to the shaft. Great trochanter weak. Shaft straight and large. Example: J. c. 2; 11, 20.
- (2) Neck and head very oblique. Great trochanter robust. Shaft straight and small. Example: J. b. 11, 1.

Both are illustrated in 'Ornithosauria,' pl. viii. figs. 5, 6, 7, and 8. In neither group are the head and neck as terminal as in *Ornithodesmus latidens*. The shaft is not curved as much as in the American forms; otherwise the description by Professor Williston\* of the femur of *Ornithostoma* (*Pteranodon*) *ingens* is near to Group 1 and also to *Nyctosaurus* (*Nyctodactylus*) †. To which genus the specimens included in Group 2 belong must remain an open question.

In concluding our examination of the Cambridge Greensand material in the Cambridge Museum, Cambridge, we find that the jaws divide into five genera—*Ornithocheirus*, *Lonchodectes*, *Amblydectes*, *Criorhynchus*, and *Ornithostoma*.

On the evidence of the premaxillæ *Ornithodesmus* is entirely separated from either genera of the Cambridge Greensand, but the fragments of the humeri and ulnæ of Group A must undoubtedly be incorporated into the same family, and there is nothing to prove that the humeri and ulnæ included in Group A should be assigned to reptiles possessing premaxillæ typical of one of the five genera. Neither can any of the other bones of the axial skeleton be

\* S. W. Williston, Kansas Univ. Quart. 1893-4, ii. p. 80.

† *Id.* Field Col. Mus. Pub. 78, geo. ser. 1903, vol. ii. no. 3, p. 150.



apportioned to any particular genus, except those which, by comparison with the American forms, belong to *Ornithostoma*.

The other groups must remain isolated until some further discovery determines their relationship.

### CLASSIFICATION.

#### Family Ornithocheiridæ.

##### Subfamily ORNITHOCHEIRINÆ.

Genera ORNITHOCHEIRUS (Seeley).  
LONCHODECTES.

##### Subfamily CRIORHYNCHINÆ.

Genera CRIORHYNCHUS (Owen).  
AMBLYDECTES.

#### Family Ornithostomatidæ.

Genus ORNITHOSTOMA (Seeley).  
(*Pteranodon*, Marsh.)

In conclusion, I would like to bear witness to the magnificent work of Seeley in the determination and interpretation of such fragmentary material. It must have been a most difficult task. I also desire to thank Professor T. McKenny Hughes for his courtesy and kindness in lending me the type-specimens for study.

### EXPLANATION OF PLATE XXII.

- Fig. 1.* Left lateral view of Cambridge specimen J. c. 9. *O.*, orbit; *Su.OC.CR.*, supra-occipital crest; *OC.*, occiput.  $\times$  about  $\frac{3}{2}$ .  
*Fig. 2.* Occiput of same specimen above the foramen magnum. *f.m.*, foramen magnum; *p.t.f.*, post-temporal fossæ.  $\times$  about  $\frac{1}{2}$ .  
*Fig. 3.* Posterior view of skull of same specimen. *Su.OC.CR.*, section of supra-occipital crest; *OC.*, occiput.  $\times$  about  $\frac{3}{8}$ .  
*Fig. 4.* Left lateral view of the tip of the upper jaw of *Criorhynchus sinus* (after Owen). Nat. size.  
*Fig. 5.* Left lateral view of a portion of the upper jaw of *Coloborhynchus clavirostris* (after Owen). The dotted lines indicate the amount of the upper jaw worn away by attrition. Nat. size.

LXII.—*Species of Amphipoda taken by 'Runa,' July and August 1913, not in Norman's Final Shetland Dredging Report, 1868.* By ALFRED O. WALKER.

*Lysianassa ceratina*, A. O. Walker, 1889.

Canon Norman refers "*L. costæ* ♀ and *L. longicornis* ♂ of Dredging Report of 1863 and 1864" to this species (Crust. Northumberland and Durham, in Trans. Nat. Hist. Soc. North., Durham, &c., vol. iii. part 2).

*Aristias neglectus*, Hansen.

This is *Anonyx tumida*, Goës, of the Final Report. The Shetland specimens presented to the British Museum by Dr. Norman bear Hansen's designation. *Aristias tumidus* is an Arctic species.

*Tryphosa hörungii*, Boeck.

*Socarnes erythrophthalmus*, Robertson, 1892.

*Hippomedon denticulatus* (Bate).

*Tryphosa sarsii* (Bonnier), 1891.

*Ampelisca spinipes*, Boeck.

*Metaphoxus fultoni* (T. Scott), 1890.

*Neoplustes assimilis* (G. O. Sars, 1882).

*Nototropis vedlomensis* (Bate and Westwood).

*Mæra tenuimana* (Bate).

*Gammarus duebenii*, Lillj.

*Jassa pusilla* (G. O. Sars, 1894).

*Notes on Crustacea of 'Runa' Cruise, July and August 1913.*

*Janira maculosa*, Leach.

Two specimens were found in the branchial sac of as many individuals of the Ascidian *Corella parallelogramma*. This is probably the first time this Isopod has been found as a commensal. It is, however, recorded as occurring on *Alcyonium digitatum* by Dr. P. P. Hoek (Crust. Neerland. part ii. p. 5) and by the writer (Proc. Biol. Soc. Liverpool,

vol. iii. 1889, p. 198); on this occasion they were in considerable numbers, and therefore probably not accidental, but feeding either *on*, or, more probably, *with* the polypes. Dr. W. M. Tattersall informs me that he has found it "extremely abundant wherever *Alcyonium digitatum* is to be found, and, in deep water, commonly associated with other Alcyonarians such as *Lophohelia*; also clinging to such Compound Ascidians as *Leptoclinium*." He thinks, however, that it is rather a case of protective coloration than commensalism—a question that will require careful aquarium and laboratory observations to solve.

## AMPHIPODA.

*Euonyx chelatus*, Norman.

More abundant than usual.

*Lysianassa plumosa*, Boeck.

A single young specimen, length 6 mm. This is a rare species on our coasts. When fresh its colour distinguishes it at a glance, the body-segments, especially the first two or three and those of the pleon, being blotched with pink or orange, as described by G. O. Sars. Canon A. M. Norman doubts the specific distinction between this species and *L. ceratinus*, Walker, on the ground that specimens occur "with only a small spine-point on the hinder margin of the third segment of the metasome." In the present specimen it is very slightly upturned, so as to form an acute angle (∟), which is probably a condition of immaturity. In *L. ceratinus* it is completely rounded at all ages, while the colour is a uniform yellowish white.

*Lysianassa ceratina*, Walker.

For the synonymy see Trans. Linn. Soc., 2nd ser. vol. xii. p. 327.

A single adult male. This had the peræopods 1 and 2 and uropods 3 clothed with plumose setæ, as in *L. plumosa*, Boeck. It is probably a generic character in adult males.

*Corophium crassicorne*, Bruz., and *C. bonelli*, M.-Edwards.

On Aug. 10, 1913, Dr. W. A. Herdman, in a small motor-launch from his steam-yacht 'Runa,' made a haul with a very small and light dredge with cheese-cloth bag in the south or "blind" entrance to Tobermory Harbour, depth at

low tide about 3 feet. The contents of the bag were sent to me for examination, and were found to contain no less than 19 species of Amphipods. Among these were about 40 female *Corophium bonelli*, M.-E., 3 female *C. crassicorne*, and 3 males—of which species? I may say here that I take G. O. Sars's descriptions and figures (1) as the correct representations of these species as far as they go.

Now there is a mystery about the male of *C. bonellii*. G. O. Sars (1) says he has "never met with males of this form." Norman (2) says that "Among some hundreds of specimens loosely examined there were none which at a glance would seem to be males." In 1879 Dr. P. P. C. Hoek (3) described and figured the antennæ of a male and female *Corophium* under the name of *C. crassicorne*—presumably they were taken in the same locality.

Now a comparison of these figures with those of *Corophium acherusicum*, Costa, in Della Valle's 'Gammaridea of the Bay of Naples' (pl. viii. figs. 24, 31, &c.) shows that they are identical as regards the female, and, as far as can be judged from the portion of the lower antenna shown by Hoek, probably the male also. This identity was suggested by Stebbing (5), and has been confirmed by an examination of specimens from Bône, Algeria, kindly sent to me by Mons. E. Chevreux under the name of *C. acherusicum*, Costa (1857), which, therefore, merges in the older name of *C. bonellii*, Milne-Edwards, 1830.

As regards *C. crassicorne*, Bruzelius, while the female lower antennæ differ entirely from those of *C. bonellii* (as is well shown by Sars), the males are far more difficult to distinguish. Chevreux (6) says that the males of *C. acherusicum* and *C. crassicorne* are difficult to distinguish except by the lateral angles of the head, obtuse and crenate at the extremity in the former, much produced and acute in the latter. Unfortunately this feature is difficult to see, and as the two species are found associated on our western coasts and the females of *C. bonellii* exceed the males numerically to an almost incredible degree, it is no wonder that the latter have been attributed to *C. crassicorne*. The tooth on the inner side of the third joint of the peduncle of the lower antennæ and the number of spines on the first joint of the upper antennæ in the male, which in 1898 (7) I thought distinctive, appear to be variable characters.

To the synonymy of *C. bonellii* given in the Gammaridea of 'Das Tierreich' must therefore be added *C. acherusicum*, Costa, and *C. crassicorne*, Hoek. My *C. bonnellii* in Trans. Linn. Soc., 2nd ser. vol. xii. p. 343, should be *C. bonellii*,

and not (as altered in MS. to some of my correspondents) *C. crassicorne*.

Dr. W. T. Calman, F.L.S., who most kindly assisted me in examining specimens at the British Museum, agrees with me in being unable to perceive any difference of importance between *C. bonellii* and *C. acherusicum*.

### References.

- (1) G. O. SARS. 'Crustacea of Norway,' vol. i., Amphipoda, p. 616, pls. 220, 221.
- (2) A. M. NORMAN. Crust. Devon and Cornwall, p. 95.
- (3) HOEK. Tijdschr. Nederlands. Dierk. Vereen. vol. iv. 1879, pp. 115-119.
- (4) DELLA VALLE. F. Fl. Neapel, v. 20, p. 364, t. viii. figs. 24, 31, &c.
- (5) STEBBING. 'Das Tierreich,' Gammaridea, p. 692.
- (6) CHEVREUX. Résult. Camp. Monaco (Amph. de 'L'Hirondelle'), p. 109.
- (7) WALKER. Trans. Liverpool Biol. Soc. vol. xii. 1893, p. 172.

LXIII.—*Description of a new Genus of Terrestrial Isopoda from Algiers.* By WALTER E. COLLINGE, M.Sc., F.L.S., F.E.S.

[Plate XXIII.]

SOME short time ago Dr. Leonard Doncaster very kindly entrusted to me for examination and identification a small collection of terrestrial Isopoda from the University Museum of Zoology, Cambridge. With one exception all the specimens were European. One tube contained two examples of a very striking and beautiful species from Algiers, and from a naked-eye examination I at first thought they were examples of a large species of *Niambia*, Budde-Lund\*, as they exhibited the peculiar large cavity at the junction of the flagellum with the peduncle of the antennæ; a more minute examination, however, proves them to be quite distinct from that genus, although distantly allied.

*Paraniambia tuberculata*, gen. et sp. n.

Body (Pl. XXIII. fig. 1) oblong-oval, dorsal face slightly convex, with numerous large tubercles on the head and

\* "Land-Isopoden," Jen. Denkschrift. Gesell. 1909, Bd. xiv. p. 59.  
*Ann. & Mag. N. Hist.* Ser. 8. Vol. xiii. 38

thoracic segments. Cephalon richly tuberculated and partially flanked by the lateral plates of the first segment of the mesosome; lateral lobes well developed and turned upwards, median lobes absent. Eyes large, subdorsal. Antennulæ (fig. 2) small, 3-jointed. Antennæ (fig. 3) long, fifth joint largest, the flagellum articulating with the peduncle in deep cavity, exceedingly mobile; flagellum 2-jointed, with a smaller 2-jointed terminal portion. Mandibles (figs. 4 & 5) stout, with four teeth and two tufts of setæ. First maxillæ (fig. 6), outer lobe with three large and four smaller incurved spines, inner lobe (fig. 7) with two setaceous spines on the inner border. Second maxillæ thin and plate-like. The segments of the mesosome 1-3 richly tuberculated with large processes, remaining segments with finer and much smaller tubercles; lateral plates not expanded, posterior angle overlapping next segment. Maxillipedes (fig. 8) large and well developed; the outer lobe terminates in three small spines and a large multispinous process; inner lobe distally flattened with three small marginal spines. The ventral surface of the body is raised and fringed outwardly with small spines. Thoracic appendages (fig. 9) large and characterized by a series of short blunt marginal spines, general surface of the segments covered with small pointed spines. On the second appendage, at the distal end and outer side of the protopodite is a small pit-like depression lined with minute spines (fig. 9, *p.d.*). Abdominal appendages (figs. 10 *a-b*), first small (probably degenerate), second (fig. 10 *b*), exopodite triangular in shape, with knob-like thickening on the outer lower border, endopodite small. Uropoda (fig. 11) well developed, basal plate large, exopodite broad and blunt, endopodite attached above and on the inner border, slender, and shorter than exopodite. Telson small and triangular.

Length 22 mm.

Colour (in alcohol) creamy brown, with slaty-grey abdomen.

*Hab.* Algeria, 1873 (*J. W. Clark*).

*Type.* In the University Museum of Zoology, Cambridge.

In the form of the antennæ, first maxillæ, telson, and uropoda the genus shows a relationship with the genus *Niambia*, Budde-Lund, but differs from the known members of that genus in all other features. The peculiar form of the lateral lobes of the head at once separate this genus from any other I know of. Instead of being flat-like extensions of the head disposed horizontally, they are turned vertically inwards. There is no trace of any median lobe, the front of the head gradually sloping over on to the epistoma.

## EXPLANATION OF PLATE XXIII.

- Fig. 1. Dorsal view,  $\times 3$ .  
 Fig. 2. Antennule.  
 Fig. 3. Antenna.  
 Fig. 4. Left maxilla, inner side.  
 Fig. 5. Part of left maxilla, outer side.  
 Fig. 6. First maxilla, outer lobe.  
 Fig. 7. First maxilla, inner lobe.  
 Fig. 8. Left maxillipede.  
 Fig. 9. Second thoracic appendage. *p.d.*, pit-like depression.  
 Fig. 10 *a*. First right abdominal appendage.  
 Fig. 10 *b*. Second right abdominal appendage.  
 Fig. 11. Uropod from right side.

LXIV.—*A new Nycteris from N.W. Rhodesia.*

By KNUD ANDERSEN.

*Nycteris woodi*, sp. n.

A member of the *N. æthiopica* group (see Ann. & Mag. N. H. (8) x. p. 549, Nov. 1912), differing from the other representatives of the same group by its much smaller size and relatively longer ears, and from all other forms of the genus by having the fur of the underparts pure white, without any trace of darker bases to the hairs.

Forearm 42.5 mm.; ear from base of inner margin (relaxed) about 29. Skull, total length to front of canine 18.2; condylo-canine length 15.8; maxillary tooth-row (crowns) 6.

*Type*, skin and skull of an adult, Chilanga, N.W. Rhodesia, 4100', Nov. 1913, presented by R. C. Wood, Esq. B.M. 14. 4. 22. 2.

LXV.—*On small Mammals from Djarkent, Central Asia.*

By OLDFIELD THOMAS.

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THE British Museum owes to the generosity of the Hon. N. Charles Rothschild the donation of a series of upwards of 300 small mammals collected by Mr. W. Rückbeil at Djarkent, Semiretchensk, Central Asia, a place situated on the Uszek River, Middle Ili, at the western end of the Thian-shan Mountains. A few specimens were also obtained by

Mr. Rückbeil at Przewalsk, on the Issyk-kul, about 150 miles to the south-west of Djarkent.

The collection is of so much value to the Museum and so much scientific interest that I have thought it advisable to give a full list of it.

Thirty-one species are included, of which six prove to be new.

1. *Nyctalus noctula*, Schr.

Thirteen specimens.

2. *Pipistrellus pipistrellus lacteus*, Temm.

Fourteen.

For reasons as to the use of the name *lacteus* see Ann. & Mag. Nat. Hist. (8) iii. p. 258 (1909).

3. *Erinaceus albulus*, Stol.

Seven.

4. *Neomys fodiens orientis*, subsp. n.

*Male*. "From the swamps of the River Kamennaja retschka."—*W. R.*

Size rather large; fur long. Tail short, with well-developed white fringe and white pencil at tip. Colour as in true *fodiens*, the under surface washed with yellowish white. Sole-pads apparently larger than in the European form.

Skull with rather higher and more rounded brain-case, the lateral flanges not so abruptly projected outwards. Interparietal not so far projected forwards between the parietals as in most specimens of *fodiens*.

*Teeth*.—Anterior upper incisor slenderer, less abruptly curved downwards, more projected forwards than in *fodiens*, the anterior curved edge forming a smaller segment of a larger circle. Front unicuspid longer than in *fodiens*, its outer cingulum more nearly horizontal.

Dimensions of the type (measured in the flesh):—

Head and body 88 mm.; tail 55; hind foot 18.

Skull: condylo-basal length 21.1; condylo-incisive length 22; breadth across brain-case 10.8; bottom of nasal notch to front angle of interparietal 15.5; height of brain-case from basion 5.9; upper tooth-series 10.5; basal diameter of shaft of *i*<sup>1</sup> 0.8; horizontal length of anterior unicuspid 1.5.

*Type*. Adult male. B.M. no. 14. 5. 10. 33. Original number 378. Collected 30th December, 1913.



This water-shrew is very like the *N. fodiens* of Northern Europe, but would seem to be sufficiently distinguished by the characters above described. Owing to its long rich fur, strongly contrasted coloration, and well-marked white caudal fringe it is even more beautiful than most examples of the European animal.

### 5. *Sorex araneus*, Linn.

Two. "In die Schlucht Narin."—*W. R.*

Although with rather more prominent front incisors than ordinary *araneus*, and thus leading on towards the species now to be described, these shrews can be matched in this respect by some Scandinavian specimens, and may therefore be assigned to *S. araneus*. On the other hand, the shrew of the same group from the Thian-shan should certainly bear a special name. Indeed, I distinguished and named it some years ago, but its description seems never to have been published.

### *Sorex asper*, sp. n.

Allied to *S. araneus*, but the upper incisors and unicuspid much enlarged.

Colour brown, no tricolor pattern perceptible. Under surface of a summer specimen also brown, little lighter than the upper colour; of a winter specimen hoary grey with slaty bases to the hairs. Fur of summer specimen 4, of winter specimen 7.5 mm. in length.

Skull like that of *S. araneus*, but the muzzle longer.

Anterior upper incisors large, heavy, much projected forwards, their upper front profile starting forwards nearly horizontally from the bone supporting them, instead of being continued in the same slanting line as the profile of the bone. Unicuspid very large and heavy, the combined length of the first three 2.3 mm., their breadth especially great in proportion. Molars not larger than in *araneus*, so that the muzzle is longer in proportion than in that species.

Dimensions of the type (measured in the flesh):—

Head and body 65 mm.; tail 37; hind foot 12; ear 8.

Skull: condylo-basal length 19.5; condylo-incisive length 20.2; breadth across brain-case 9.6; tooth-series 9; front of  $i^1$  to front of  $p^4$  4.5.

*Hab.* Thian-shan. Type from the Tekes Valley, others from Kok-su.

*Type.* Adult male. B.M. no. 5. 4. 8. 2. Collected

11th September, 1904, and presented by Mr. A. B. Bayley-Worthington. Seven specimens.

6. *Sorex minutus*, L.

Fifteen.

7. *Crocidura ilensis*, Mill.

Twelve.

8. *Felis caudata*, Gray.

Two.

9. *Putorius eversmanni*, Less.

Male.

The British Museum series of Asiatic polecats shows these animals to be by no means so unvarying in colour as might be supposed from Mr. Hollister's statement as to their constancy. In two cases sets from the same place differ considerably *inter se*, as, for instance, in the brown or white colour of the crown, and there is, of course, always a wide difference between winter and summer specimens.

10. *Mustela erminea ferghanæ*, Thos.

Three males, in winter pelage.

In addition to these three specimens I have before me a female in winter pelage from Przewalsk (Coll. Kutsenko) and the type, in summer pelage, from Mt. Kara-Karyk, Ferghana (Coll. Barey). The last was said by its collector to be a male, a statement I published when describing the subspecies; but while the skin shows no external evidence of sex, its agreement in size and skull-characters with Mr. Kutsenko's female is so close that I am now disposed to think that it also is a female.

This mistake, to which I regret that I gave currency, may result in the invalidation of Mr. Hollister's "*Mustela lymani*," described on a male so much larger than the Ferghana specimen that Mr. Hollister appeared to be quite justified in distinguishing it, on the assumption that the sexes were the same. Further summer skins of both forms will, however, be needed before this question can be definitely settled.

11. *Mustela sacana*, sp. n.

♂ & ♀. Przewalsk.

Proportions and general appearance as in *M. altaica*, Pall. (*M. alpina*, Gebl.), the body of a similar buffy colour above,

and the crown vinaceous buff. Under surface pale yellowish white, not sharply defined laterally, yellower on the throat and belly, becoming gradually whiter on the chin and undersides of limbs, but without the marked contrast between a pure white chin and a strongly yellow or buffy throat. Palms and soles with an intermediate state of hairiness between that found in *altaica* and *longstaffi*, the ends of the digits and the median pad exposed, but less so than in *longstaffi*, and the proximal carpal pad—prominently open in the latter species—quite hidden in the fur.

Skull and teeth about as in *altaica*, though the inner edge and antero-internal corner of the bullæ are less angularly prominent.

Dimensions of the type (measured on the skin, and therefore only approximate):—

Head and body 280 mm.; tail 180; hind foot 45.

Skull: basal length 48·5; greatest breadth 28·5; interorbital breadth 11·5; intertemporal breadth 10·2; mastoid breadth 24; palatal length 23·7; maxillary tooth-row 16·3;  $p^4$  6;  $m^1$ , transverse diameter 4·3, breadth of inner lobe 2·4.

*Type.* Adult male. B.M. no. 14.5.10.64. Original number 438.

This fine weasel is intermediate in characters, as in locality, between *M. altaica* of the Altai and *M. longstaffi* of the Upper Sutej and Ladak; and it is possible that hereafter all three may be considered as subspecies of one widely spread species. The marked differences in the degree of hairiness of the feet, however, prevent my adopting this course without further intergrading material. Apart from the feet, *M. sacana* may be distinguished from *altaica* by the absence of contrast in the colour of the chin and throat, from *longstaffi* by its more yellowish belly, not defined laterally, and from *M. temon* by its larger size.

## 12. *Mustela* sp. (probably *pallida*, B.-Ham.).

Two males in winter pelage.

Barrett-Hamilton's type of *pallida* being a female, and both the present specimens being males in winter pelage, it is impossible to express any definite opinion as to the latter's relationship to *pallida* or to Blanford's *stoliczkana*, of which the figured skull is, however, larger than those of Mr. Rückbeil's two males.

## 13. *Mustela nivalis*, L.

Four males, one in summer, one in changing, and two in winter pelage.

A small form of weasel, corresponding closely to *M. n. caucasica*, Barr.-Ham.

14. *Marmota centralis*, Thos.

Five.

15. *Dyromys angelus*, Thos. (?).

Male (immature).

Too young to be determined with certainty.

16. *Meriones tamaricinus*, Pall.

Twenty-one.

17. *Meriones meridianus*, Pall.

Ten.

18. *Rhombomys opimus*, Licht.

Fourteen.

19. *Mus wagneri*, Eversm.

Twelve.

Differ a good deal among themselves. Some may be related to *M. pachycercus*, Blanf.

20. *Apodemus tscherga*, Kashtch.

Ten.

Topotypes of *A. microtis*, Mill.

21. *Cricetulus fulvus*, Blanf.

Eighteen.

22. *Evotomys centralis*, Mill.

♂. 291. "In Wald Schluchtes Tischkan."—*W. R.*

23. *Arvicola terrestris scythicus*, subsp. n.

Twelve specimens.

A large race of the Scandinavian *terrestris*.

Size nearly equalling that of *amphibius*. General colour about as in *amphibius* or in light-coloured examples of *terrestris*, not so dark as is commonly the case in the latter; the reddening of the cheeks characteristic of *terrestris* well marked. Tail black, scarcely lighter below, its tip in nearly every specimen with a small white pencil.

Skull nearly as large as in *amphibius*, but with the fossorial characteristics of that of *terrestris* not only well marked but intensified; the incisors even more thrown forward and the supraoccipital area so slanted forward that in vertical view it equals the interparietal in apparent extent. In *amphibius* it is scarcely visible at all from above, in *sapidus* and *terrestris* it appears decidedly less in extent than the interparietal, and only in the small and nearly completely fossorial *scherman* does it equal the interparietal as in *scythicus*. Though large, the skull is not highly ridged, certainly less so than in *amphibius*.

Teeth about as in *terrestris*, the incisors slightly more thrown forwards.  $M^3$  consisting of only three triangles and a simple posterior lobe, as in Scandinavian *terrestris* (cf. Blasius's figure 188 \*).

Dimensions of the type (measured in flesh):—

Head and body 200 mm.†; tail 130; hind foot 34.

Skull: condylo-basal length 42; condylo-incisive length 42·5; zygomatic breadth 24·8; nasals  $11·6 \times 4·7$ ; palatilar length 22·6; upper molar series 9·6.

*Type.* Old female. B.M. no. 14. 5. 10. 154. Original number 255. Collected 5th May, 1913.

This water-vole is a large race of the Scandinavian *A. terrestris*, with which it agrees in its more essential characters. It will probably be found to be the form which occurs throughout Asiatic Russia.

The striking revision of the water-voles recently published by Mr. Miller‡ has alone enabled me to appreciate the true relationship of this fine animal.

#### 24. *Microtus (Microtus) ilæus*, Thos.

Nineteen specimens.

The type of this well-marked species was in the first collection sent by Mr. Rückbeil (B.M. no. 11. 12. 14. 30).

The specimens are labelled as having been caught along the banks of the Uszek and Ili Rivers.

Some of the skulls have an unusually long median spike at the posterior end of the palate, while in others this is entirely absent.

#### 25. *Microtus (Microtus) obscurus*, Eversm.

Thirty specimens.

\* Säug. Deutschl. p. 345.

† This measurement is probably too large. Other specimens are measured as 166, 167, and 178 mm. in trunk-length.

‡ Cat. Mamm. W. Europe, p. 724 (1912).

Of the two small voles of this region I assigned, in my paper on the Carruthers mammals, the name *eversmanni*, Poliakoff, to the *Microtus*, and not to the *Stenocranius*, on the ground that Büchner's figure of the skull clearly indicated a *Microtus* and that, as he mentions Poliakoff's original specimens, this figure might be supposed to be taken from one of them. Whether Büchner's Przewalski specimens were of the same form or not did not affect the question.

Since I wrote, however, Mr. Hollister\*, in agreement with Kashtchenko, has again put *eversmanni* into *Stenocranius*, and I therefore now accept his conclusion, at least until an expert examination can be made of the types in St. Petersburg.

26. *Microtus (Stenocranius) tianschanicus*, Büchn.

Four specimens.

"In die Schlucht Tischkan."

27. *Alicola worthingtoni subluteus*, subsp. n.

♂. 324; ♀. 323. "In die Schlucht Tischkan."

Like true *worthingtoni* in all essential characters, but the pure white of the end of the hairs of the lower surface replaced by "pale pinkish buff" (Ridgway, 1912). Hands, feet, and tail also with a slight buffy tinge.

Skull and teeth as in *worthingtoni*.

Dimensions of the type (measured in flesh) :—

Head and body 95 mm.; tail 40; hind foot 20; ear 16.

Skull: greatest length 26·5; upper tooth-row 5·7.

Type. Slightly immature female. B.M. no. 14. 5. 10. 186. Original number 323. Collected 20th July, 1913.

28. *Ellobius ursulus*, Thos.

Seventeen specimens. "In die Schlucht Malaja-Aksu."—*W. R.*

This series shows well how the colour intensifies as age advances, the younger specimens being greyish buff, while the older ones attain a rich cinnamon.

I can find no tangible difference between the Djarkent examples and the three original specimens obtained by Mr. Carruthers on the southern slopes of the Barlik Mountains.

By the help of this series, however, I am now able to distinguish the skull of *ursulus* from that of the Samarkand

\* Proc. U.S. Nat. Mus. xlv. p. 516 (1913).

*fusciceps*, of which I originally described this *Ellobius* as a subspecies.

In *E. fuscipes* the lambdoid ridge is continuous and well defined right across the skull, bowed forwards in its middle third. In *ursulus* it is practically obsolete for this middle third, the crown and occipital areas passing almost smoothly into one another. In *ursulus*, also,  $m^3$  tends to be rather simpler than in *fusciceps*.

## 29. *Allactaga rückbeili*, sp. n.

Six.

*A. mongolica* group.

Size about as in *A. suschkini* and *mongolica*, larger than in *saltator*. Colour rather paler than in our examples of *saltator*. Crown distinctly greyer than back. Ears proportionally long, apparently about as long as in *suschkini*. Hands and feet pure white; central sole-pad uncovered in all the specimens, covered with hair in all the available examples of *mongolica* and *saltator*. Tail buffy above, white below, with well-marked white ring before the black one, black ring varying from about 45 to 55 mm., measured from its commencement in the middle line to the tips of the longest hairs; white terminal tufts short, only about 30–35 mm. measured in the same way.

Skull larger than in *saltator*, with shorter muzzle than in *mongolica*.

Dimensions of the type:—

Head and body 150 mm.; tail 220; hind foot (s. u.) 76; ear 49.

Skull: greatest length, occiput to gnathion, 39; condylo-incisive length 38·3; zygomatic breadth 25·8; nasals 14·3 × 6; interorbital breadth 10·8; breadth of brain-case 19; palatal length 22·5; palatal foramina 8·7; molar series (exclusive of premolar) 6·3.

*Type.* Adult female. B.M. no. 14. 5. 10. 203. Original number 247. Collected 6th April, 1913.

“On banks of River Uszek.”

This jerboa is probably most nearly allied to *A. suschkini*, from north of the Aral Sea, but is distinguished by having a well-marked white ring before the black one of the tail, no trace of such a ring being present in *suschkini*, and, on the other hand, by its very much shorter white terminal tuft. From *A. saltator* it is distinguished by its larger size and the more open condition of the foot-pads. Mr Hollister's *A. griseus*, coming not only from the general region, but

from the actual type-locality of *saltator*, must, I think, be synonymous with it. Like that animal, it is distinctly smaller than *A. rückbeili*.

I have connected Mr. Rückbeil's name with this jerboa in recognition of the pains he has taken in making this interesting collection of Djarkent mammals.

30. *Allactaga elater*, Licht.

Eleven.

31. *Lepus* sp.

Three.

Probably *L. lehmanni*, Sev.

32. *Ochotona sacana*, sp. n.

Seven from Przewalsk.

Like *O. macrotis*, but warmer coloured, especially on the flanks.

Size and all essential characters as in *O. macrotis*. General colour above in winter pelage buffy brown of a considerably warmer and stronger tone than the whitish buffy of the winter pelage of *macrotis*. On the sides and rump, instead of getting whiter, the ends of the hairs become more rufous, so that the flanks are distinctly cinnamon, the basal two-thirds of the hairs being, however, still dark plumbeous and a subapical band white. Under surface dull whitish, faintly washed with cinnamon. Centre of face pale cinnamon. Ears large, blackish brown on proectote, greyish white on metentote. Hands and feet buffy white above; palms and soles greyish.

Skull as in *O. macrotis*. Frontal vacuities present in all the specimens.

Dimensions of the type (measured on skin):—

Head and body (c.) 200 mm.; hind foot 33; ear 28.

Skull: greatest length 47; condylo-incisive length 44; zygomatic breadth 22·5; nasals 16 × 5·5; interorbital breadth 5·3; breadth of brain-case above meatus 18; palatal foramina 13·5 × 4·7; breadth of palatal bridge 1·8; upper tooth-series (alveoli) 9.

*Hab.* Przewalsk.

*Type.* Adult male. B.M. no. 14. 5. 10. 219. Original number 442. Collected 15th December, 1913.

While undoubtedly nearly allied to *O. macrotis*, this pika



is readily distinguishable by its cinnamon-washed sides and rump and the more blackish backs to its ears. Mr. Caruthers's Karakoram specimens of *macrotis* are, like these, in full winter pelage, and have afforded good material for comparison.

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LXVI.—*Three new S.-American Mammals.*

By OLDFIELD THOMAS.

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*Pseudalopex smithersi*, sp. n.

*Ps. culpæus* group, but the body reddish throughout.

Size apparently rather less than in *culpæus*. Fur soft and thick, not very long. Colour wholly unlike that of any known *Pseudalopex*, owing to the black on the tips of the hairs, which forms so prominent a feature in the colouring of other species, being here replaced by rich ochraceous red, the underfur being still creamy buff terminally and slaty basally. On the tail alone the terminal brush is, as usual, black, the bases of the hairs buffy, and the hairs of the caudal gland are black terminally and white for their basal two-thirds; the hairs of the rest of the tail tipped with rich ferruginous. As a result we have an animal which is bright reddish, head, body, and limbs, though, owing to the buffy underfur, the colour is not as strong as in some of the purely red Canidæ. Under surface dull buffy whitish on throat and lower belly, deeper and more pinkish buffy on the chest and sides of belly. Chin with a slight darkening, as in *culpæus*, not a definite black patch as in the *azarica* group; nor is there any trace of a dark patch on the back of the thighs.

Dimensions, owing to the specimen being a made-up tanned skin, not able to be taken, but the size appears to be somewhat less than in *Ps. culpæus*.

*Hab.* Sierra de Cordoba, Argentina.

*Type.* Adult skin, without skull. B.M. no. 14. 3. 18. 1. Obtained and presented by W. A. Smithers, Esq.

This most remarkable mountain-fox is closely related to *Pseudalopex culpæus*, but is at once distinguished from that and every other member of the genus by the replacement of the grizzled black and white of the body by rich ferruginous.

Mr. Smithers had heard of this interesting inhabitant of the Cordoba highlands for some time, and has at last been able to obtain a hunter's skin of it. Though without a skull, there can be no doubt whatever either as to its affinities or of its distinctness from any previously described species.

It has been to Mr. Smithers that we already owe the specimens of Azara's fox which I took as typical of *Pseudalopex azarica*, and I now have great pleasure in connecting his name with the present striking animal, in whose discovery he has been instrumental.

*Microsciurus avunculus*, sp. n.

Closely similar to *M. napi*, but markedly larger throughout.

Size a little larger than in any described species. General colour above finely grizzled olive-brown, the fore back slightly greyer, the hind back warmer. Chest greyish "cinnamon-buff," not such a bright ochraceous as in *M. rubrirostris*; belly and inner sides of hind limbs dull tawny, toned down by the slaty bases of the hairs. Crown finely ticked with ochraceous, a little warmer than nape, more like hind back, not so ochraceous as in *rubrirostris*. Ears with their inner surface grizzled ochraceous; outer surface grey anteriorly, with a large whitish patch posteriorly, the upper part of this patch buffy. Hands and feet grizzled ochraceous. Edges of tail pale buffy.

Skull conspicuously larger than that of *M. napi*, about as in *M. rubrirostris*.

Dimensions of the type:—

Hind foot, s. u. 39, c. u. 42 mm.; ear 15.

Skull: tip of nasals to front of interparietal 35.5; condylo-incisive length 34; zygomatic breadth 23.3; nasals 11 × 4.8; interorbital breadth 14.2; breadth of brain-case 19; palatal length 16; tooth-row (exclusive of  $p^3$ ) 6.2.

*Hab.* Oriente of Ecuador. Type from Gualaquiza; alt. 2500'.

*Type.* Young adult male. B.M. no. 14. 4. 25. 53. Original number 312. Collected 31st November, 1913, by Gilbert Hammond. Presented by Oldfield Thomas.

This species is in colour quite like *M. napi*, which occurs in the same region, but is so much larger, as evidenced by its skull- and tooth-measurements, that it is clearly different. It is probably most nearly related to *M. rubricollis*, the species I have always regarded as *M. peruanus*, Allen, but is distinguished from both by its much duller and less contrasted under surface.

Dr. Allen, in his recent paper, considers his *M. peruanus* as only doubtfully distinguishable from Gray's "*Macroxus kuhlii*," said to have been collected by Castelnau, and therefore thought by Dr. Allen to have come from somewhere on the Upper Amazons. But Dr. Allen has quite misunderstood the characters of *kuhli*\*, which is beyond question the "*Sciurus pusillus*" of Guiana, whence the type must have come—probably accidentally mixed with Castelnau material by the dealer (Paizudaki) from whom it was bought. The fact that the hind foot of the type of *kuhli* is only 26 mm. in length would alone distinguish it from any of the Andean *Microsciuri*.

Most opportunely three specimens of the Guianan pigmy squirrel have just been received from the late Mr. McConnell's collector Cozier, one of them having a perfect skull, and I am now able to state that this animal is not a *Microsciurus* at all, but represents a new genus allied to the Malayan and W.-African pigmy squirrels. Its description is given elsewhere, but a new subspecies of it may be here described:—

*Sciurillus pusillus glaucinus*, subsp. n.

Like *S. pusillus*, but much paler throughout.

General colour above "neutral grey" instead of greyish hair-brown. Under surface pale grey washed with light buffy, instead of dark grey washed with fulvous. Crown, muzzle, and inner side of ears pale grizzled buffy, many shades lighter than the almost ferruginous colour of *pusillus*. Back of ears and patches behind them prominently snowy white. Feet grizzled buffy. Tail-hairs tipped with whitish, a number of hairs in the terminal pencil black, a line along the centre below also black.

Skull apparently rather smaller than in *pusillus*, but the type is not as old as the available examples of that animal.

Dimensions of the type (measured on the skin):—

Head and body 104 mm.; tail 113; hind foot 27·7.

Skull: greatest length 27·5; condylo-incisive length 25; zygomatic breadth 20; nasals (on outer edge) 7 × 4·7; inter-orbital breadth 12·5; breadth of brain-case 15; palatilar length 10; upper tooth-series (exclusive of  $p^3$ ) 3·8.

*Hab.* Great Falls of Demerara River, British Guiana.

*Type.* Adult male. B.M. no. 14.4.21.1. Collected by Cozier in August 1913, and presented by Mrs. F. V. McConnell.

\* If this has been at all due to any statement or omission in my letters to him on the subject, I must ask his pardon.

LXVII.—*Description of a new Snake of the Genus Coluber from Northern China.* By G. A. BOULENGER, F.R.S.

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*Coluber halli.*

Snout rounded, feebly prominent; canthus rostralis distinct, loreal region concave; eye moderate, half length of snout. Rostral broader than deep, the portion visible from above measuring about one-fourth its distance from the frontal; internasals a little broader than long, shorter than the præfrontals; frontal once and a half or once and three-fifths as long as broad, as long as its distance from the rostral, as long as the parietals; loreal a little longer than deep; præocular large, single or divided, with a small subocular below it; two postoculars; temporals 2 or 3+3 or 4; eight upper labials, fourth and fifth entering the eye; five or six lower labials in contact with the anterior chin-shields, which are as long as or a little longer than the posterior. Scales in 25 rows, very strongly keeled, of outer row smooth. Ventrals not angulate laterally, 173; anal divided; subcaudals 58 (♀) to 65 (♂). Brown above; vertebral region lighter, with a series of large transversely elliptical spots of a darker brown with a fine blackish edge; a lateral series of much smaller spots, alternating with the above; a dark brown band from eye to eye across the præfrontals and a broader one from the eye to the last upper labial; further markings on the back of the head expanding into two large blotches on the occiput and nape; upper lip yellowish, spotted or speckled with brown; lower parts yellowish, with small greyish spots; larger blackish spots on the sides of the belly.

Total length 940 mm.; tail 180.

Two specimens, male and female, were found in rocky gullies in the Chikfeng (Hata) District, N. Chihili Province, by Mr. A. L. Hall, and presented by him to the British Museum.

This species is allied to *C. dione*, Pall., which was found in the same district by Mr. Hall. It is easily distinguished by its strongly keeled scales.

LXVIII.—*Notes on the Forficularia.*—XXI. *Progress in Dermaptera in 1912 and 1913.* By MALCOLM BURR, D.Sc., F.E.S., F.Z.S., F.G.S., F.L.S.

IN response to the suggestion of several friends I offer the following notes on the progress in our study of the taxonomy of the Dermaptera since the appearance of my Fascicule in Wytsman's 'Genera Insectorum' in 1911.

It will be observed that several new genera and a large number of new species have been characterized, and several important alterations of generic position and of synonymy effected.

I hope at an early date to publish a paper which will very considerably modify the existing system in detail, though not much in general, embodying the results of the comparative study of the opisthomeres, the wing-venation, the manubrium of the ninth sternite of the male, and of the genital armature of the male, and of the gonapophyses of the female, in a considerable amount of material, amplifying and enlarging the very valuable work of Zacher on these lines. The results will profoundly modify the generic arrangement of the Psalidæ, but will not have any very far-reaching effect upon the other groups.

The following is the list of works referred to in this paper which have appeared since the publication of the Fascicule on Dermaptera:—

- BURR, MALCOLM, D.Sc. (1911<sup>15</sup>.) "Contribution to our Knowledge of Indian Earwigs." *Journal of the Asiatic Society of Bengal*, vol. vii. no. 11, pp. 771–800 (December, 1911).
- . (1912<sup>1</sup>.) "A new Species of *Arizenia* (Dermaptera)." *Ent. Month. Mag.* (2) xxiii. pp. 105–106, fig. (1912).
- . (1912<sup>3</sup>.) "Interesting Dermaptera in the Budapest Museum." *Annales Musei Nationalis Hungarici*, x. pp. 281–284 (1912).
- . (1912<sup>4</sup>.) "Die Dermapteren des k. k. naturhistorischen Hofmuseums in Wien." *Annalen des k. k. naturhistorischen Hofmuseums*, pp. 63–108. (Wien, 1912.)
- . (1912<sup>5</sup>.) "Ueber einige neue und interessante Dermapteren aus dem Königl. Zoolog. Museum Berlin." *SB. Ges. naturf. Fr. Berlin*, no. 5, pp. 310–330, figs. 1–5 (1912).
- . (1912<sup>6</sup>.) "Dermaptera from Java and Sumatra." *Notes Leyden Mus.* vol. xxiv. Note 37, pp. 225–229 (1912).
- . (1912<sup>7</sup>.) "Nachträge zur meiner Bearbeitung der Dermapteren des k. k. naturhistorischen Hofmuseums." *Annalen des k. k. Hofmus. Wien*, pp. 331–340 (1912).
- . (1913<sup>3</sup>.) H. Sauter's 'Formosa-Ausbeute: Dermapteren.' *Ent. Mitth.* ii. pp. 65–70 (1913).
- . (1913<sup>4</sup>.) "Zoological Results of the Abor Expedition, 1911–12. —X. Dermaptera." *Rec. Ind. Mus.* viii. pp. 135–147.

- BURR, MALCOLM, D.Sc. (1913<sup>5</sup>.) "Indian Dermaptera collected by Dr. A. D. Imms." Journ. Proc. Asiat. Soc. Bengal (n.s.), ix. no. 5, pp. 183-187 (1913).
- (1913<sup>6</sup>.) "New Guinea Dermaptera, collected by Dr. P. N. van Kampen and K. Gjellerup (1910-1911)." Tijdschrift voor Entomologie, Deel lvi. (1913).
- (1913<sup>7</sup>.) "Notas de Dermapterologia Americana." *Extracto*, Rev. Chil. Hist. Nat. xvii. no. 3, pp. 166-171 (June, 1913).
- (1914<sup>1</sup>.) "Notes on the Forficularia.—XX. A new Genus and Five new Species from Australia." Ann. & Mag. Nat. Hist. ser. 8, vol. xiii. pp. 72-77, pl. iv. (Jan. 1914).
- BORELLI, Dr. ALFREDO. (1911<sup>1</sup>.) "Diagnosi preventive di dermatteri nuovi della regione indiana." Boll. Mus. Tor. vol. xxvi. no. 640, pp. 1-4 (June, 1911).
- (1911<sup>2</sup>.) "Specie nuove di dermatteri di Costa Rica." Bol. Mus. Tor. vol. xxvi. no. 644, pp. 1-10.
- (1912<sup>1</sup>.) "Nuovo genere di Dermatteri della Repubblica Argentina." Boll. Mus. Tor. vol. xxvii. no. 649.
- (1912<sup>2</sup>.) "Di alcuni Dermatteri della Repubblica Argentina." Boll. Mus. Tor. vol. xxvii. no. 660.
- (1912<sup>3</sup>.) "Dermaptères nouveaux ou peu connus du Muséum de Paris." Bull. Mus. Hist. Nat. Paris, 1912, no. 4, pp. 1-20.
- SCHTSCHERBAKOFF, TH. S. (1912.) "Dermaptères de la Collection de v. Motschoulsky." In Russian: Rev. russe d'Ent. 1912, xii. p. 349.
- BURR, MALCOLM, and JORDAN, K. (1913.) "On *Arixenia*, Burr, a Suborder of Dermaptera." Trans. 2nd Int. Congr. Entom. vol. ii. p. 398, text-figs. 12-28 (Oct. 1913).

## Order DERMAPTERA.

### Suborder ARIXENINA.

#### Genus ARIXENIA, Jordan.

Add:—

2. *A. jacobsoni*, Burr, (1912<sup>1</sup>) p. 105, fig. Java.

The morphology and anatomy of this creature has been dealt with at some length by Jordan and Burr (1913).

### Suborder FORFICULINA.

#### Superfamily PROTODERMAPTERA.

##### Family Pygidicranidæ.

##### Subfamily ANATÆLINÆ.

Add:—

#### 2. Genus BLANDEX, Burr.

for

1. *B. solvendus*, Burr, (1912<sup>7</sup>) pp. 331, 332, fig. S. Africa.

##### Subfamily KARSCHIELLINÆ.

#### 1. Genus KARSCHIELLA, Verhoeff.

Very likely *K. bidentata*, Zacher, is identical with *K. neavei*, Burr.

## 2. Genus BORMANSIA, Verhoeff.

Add:—

- 3.
- B. orientalis*
- , Borelli, (1912
- <sup>3</sup>
- ) p. 1. Mozambique.

## Subfamily PYGIDICRANINÆ.

## 4. Genus KALOCRANIA, Zacher.

Add:—

7. *K. raja*, Burr, (1911<sup>15</sup>) p. 773. India.  
 8. *K. semenoffi*, Burr, (1912<sup>6</sup>) p. 311, fig. 1. Amu Darja.  
 9. *K. grotei*, Burr, (1912<sup>6</sup>) p. 312, fig. 2. German East Africa.

## 5. Genus DICRANA, Burr.

Add:—

- 11.
- D. hackeri*
- , Burr, (1914
- <sup>1</sup>
- ) p. 72, fig. Queensland.

## 8. Genus PYGE, Burr.

Add:—

6. *P. sauteri*, Burr, (1912<sup>5</sup>) p. 314. Formosa.  
 7. *P. shortridgei*, Burr, (1914<sup>1</sup>) p. 73. W. Australia.

## Subfamily PYRAGRINÆ.

The genus *Propyragra*, Burr (1910), coincides with *Pyragropsis*, Borelli (1908), fresh material showing that Borelli was deceived by a defective specimen when he erected *Pyragropsis*; v. Burr, (1912<sup>7</sup>) p. 332.

*Psalis thoracica*, Serv., is to be moved to *Pyragropsis*, as evidenced by fresh material in my collection.

## Subfamily ECHINOSOMATINÆ.

## 1. Genus ECHINOSOMA, Serv.

Add:—

- 16.
- E. dentiferum*
- , Borelli, (1912
- <sup>3</sup>
- ) p. 3. Bhutan.

## Family Labiduridæ.

In the key to the subfamilies (p. 24) there is a serious mistake.

|      |      |   |             |   |   |   |   |   |   |
|------|------|---|-------------|---|---|---|---|---|---|
| For  | 4.   | " | metasternum | . | . | . | . | . | " |
|      | 4.4. | " | metasternum | . | . | . | . | . | " |
| read | 4.   | " | mesosternum | . | . | . | . | . | " |
|      | 4.4. | " | mesosternum | . | . | . | . | . | " |

As a matter of fact, this character does not hold good throughout the group, as in the recently discovered Psalid genus *Spondox* the mesosternum is truncate posteriorly.

The best feature to characterize the *Psalinæ* is the great length of the membranous manubrium on the inner margin of the ninth sternite of the male, which in the *Psalinæ*, and only here, is at least one and a half, often three, times as long as the sternite itself. This is quite a new character, and will be discussed comparatively in a paper shortly to be published.

#### Subfamily *ALLOSTETHINÆ*.

##### 2. GENUS *GONOLABIDURA*, Zacher.

Add:—

2. *G. astruci*, Burr, (1911<sup>15</sup>) p. 776. S. India.

With regard to *G. volzi*, I have since seen Zacher's type; it is distended and bleached by spirit, but undoubtedly identical with the syntypes in my possession of *G. piligera*, Borm.

##### 3. GENUS *ALLOSTETHELLA*, Zacher.

I have since compared the types of Zacher's two species with that of *A. doriae*, Dubr. I have no doubt whatever that they are mere colour-variants of one and the same species, the discoidal spot of the elytra being very unstable in size and intensity.

#### Subfamily *ESPHALMENINÆ*.

##### 1. GENUS *ESPHALMENUS*, Burr.

Add:—

6. *E. porteri*, Burr, (1913<sup>7</sup>) p. 170, fig. 21. Chili.

#### Subfamily *PSALINÆ*.

##### GENUS *GONOLABIS*, Burr.

8. *G. woodwardi*, Burr, is removed to *Mongolabis*.
9. *G. brunneri*, Dohrn, " " "
11. *G. pacifica*, Erichs., " " "
6. *G. michaelsoni*, Burr, " " *Eulabis*.
1. *G. kirbyi*, Burr, " " "
12. *G. kiikenthali*, Zacher, is identical with the true *G. javana* of Bormans. I have compared the types, which are the only two specimens extant, of this very well-characterized species.

##### GENUS *ANISOLABIS*, Fieber.

3. *A. vosseleri*, Burr, is removed to *Logicolabis*, Zacher.
6. *A. incerta*, Borm., is removed to *Idolopsalis*, and has nothing to do with *A. festæ*.
8. *A. eteronoma*, Bor., and 15. *A. aporonoma*, Bor., I consider indistinguishable from 14. *A. annulipes*, Luc.



18. *A. felix*, Burr, is identical with *Horridolabis paradoxura*, Zacher. The name *felix* has priority.  
 28. *A. albovittata*, Burr, as shown by fresh material, is a *Prolabia*.  
 38. *A. taurica*, F. de W. The reference is given wrong. It should be:—Orth. Ross. p. 47, v. Schtscherbakoff, (1912) p. 352. Probably it is a synonym of *Euborellia mæsta*, Géné.  
 46. *A. æthiopica*, Burr, is identical with *Gelotolabis burri*, Zacher.

Add:—

48. *A. horvathi*, Burr, (1913<sup>3</sup>) p. 281. N. Guinea.  
 49. *A. penetrans*, Burr, (1912<sup>4</sup>) p. 78. Mayotte.  
 50. *A. addita*, Burr, (1913<sup>3</sup>) p. 66, fig. Formosa.  
 51. *A. përvicina*, Burr, (1913<sup>4</sup>) p. 137. N.E. Assam.

#### Genus EUBORELLIA, Burr.

Add:—

14. *E. astruci*, Burr, (1911<sup>15</sup>) p. 779. S. India.  
 15. *E. aborensis*, Burr, (1913<sup>4</sup>) p. 137. N.E. Assam.

#### Genus PSALIS, Serv.

Add:—

18. *P. insulana*, Borelli, (1912<sup>3</sup>) p. 5. Grand Comoro.  
 19. *P. haenschii*, Burr, (1912<sup>5</sup>) p. 317, fig. 3. Ecuador.

#### Genus LABIDURODES, Dubrony.

*L. robustus*, Dubr., has been rediscovered; in the structure of the sternal plates it agrees with *Titanolabis*, Burr.

Add:—

#### Genus HETEROLABIS, Borelli.

for

1. *H. brasiliensis*, Bor., (1912<sup>3</sup>) p. 12. Brazil.

*Note*.—The whole classification of the Psalinæ is in a state of flux, and will be entirely remodelled in a paper shortly to be published.

#### Subfamily PARISOLABINÆ.

##### 2. Genus PSEUDISOLABIS, Burr.

Add:—

4. *P. immsi*, Burr, (1913<sup>5</sup>) p. 185, fig. Himalayas.

Add:—

##### 4. Genus PARISOPSALIS, Burr.

for

1. *P. spryi*, Burr, (1914<sup>1</sup>) p. 74. Victoria.

Subfamily *BRACHYLABINÆ*.° 2. Genus *BRACHYLABIS*, Dohrn.

Remove 4. *B. geniculata*, Montr., to *Nannisolabis*.

4. Genus *NANNISOLABIS*, Burr.

Bring here 3. *N. geniculata*, Montr.

Add:—

4. *N. formicoides*, Burr, (1911<sup>15</sup>) p. 781. S. India.

6. Genus *METISOLABIS*, Burr.

Remove *M. bifoveolata*, Bol., to *Otenisolabis*, Verh.

8. Genus *LEPTISOLABIS*, Verhoeff.

Add:—

5. *L. aliena*, Borelli, (1911<sup>2</sup>) p. 1. Costa Rica.

Superfamily **EUDERMAPTERA.**Family **Labiidæ.**Subfamily *SPONGIPHORINÆ*.1. Genus *SPONGIPHORA*, Serv.

Bring here:—

6. *S. buprestoides*, Kirby, from *Labia*.

3. Genus *VOSTOX*, Burr.

Add:—

4. *V. dugueti*, Borelli, (1912<sup>3</sup>) p. 13. Mexico.

5. Genus *SPONGOVOSTOX*, Burr.

No. 18. *S. nigrorufus*, Burr, is removed to *Hamaxas*.

Also add:—

25. *S. vicinus*, Burr, (1902<sup>7</sup>) p. 336, fig. 11. S. America.

26. *S. alter*, Burr, (1912<sup>7</sup>) l. c. fig. 13.

27. *S. basalis*, Burr, (1912<sup>7</sup>) p. 337, fig. 16. ”

28. *S. recurrens*, Burr, (1912<sup>7</sup>) p. 337, fig. 15. ”

30. *S. aborum*, Burr, (1913<sup>4</sup>) p. 140. N.E. Assam.

And bring here:—

29. *S. tricolor*, Kirby, out of *Labia*, with which *S. parvus*, Burr, (1912<sup>7</sup>) p. 336, fig. 12, is identical.

6. Genus *MARAVA*, Burr.

I have since seen the type of *Labia wallacei*, Dohrn; it is a female, but is identical with *Labia grandis*, Dubr., and not with *Prolabia arachidis*, Yers., although it has a strong superficial resemblance to the latter. The correct name is therefore *Marava wallacei*, Dohrn, and *M. grandis* is reduced to synonymy.

We must refer here, either as a variant or distinct species,

2. *M. subaptera*, Kirby, out of *Labia*.

Also add:—

3. *M. deddi*, Burr, (1914<sup>1</sup>) p. 75. Queensland.  
 4. *M. hackeri*, Burr, (1914<sup>1</sup>) p. 76. „  
 5. *M. victoriæ*, Burr, (1914<sup>1</sup>) p. 77. Victoria.

Subfamily *LABIINÆ*.1. Genus *CHÆTOSPANIA*, Karsch.

Add:—

22. *C. stiletta*, Burr, (1911<sup>15</sup>) p. 786. S. India.  
 23. *C. infernalis*, Burr, (1913<sup>3</sup>) p. 167, fig. Formosa.

Genus *LABIA*, Leach.

As noted above, the following are removed from this genus:—

16. *L. subaptera*, Kirby, to *Marava*.  
 26. *L. tricolor*, Kirby, to *Spongovostox*.  
 27. *L. buprestoides*, Kirby, to *Spongiphora*.

Also

41. *L. tuberculata*, Borelli, to *Spongovostox*.

Add:—

49. *L. pyropi*, Borelli, (1913<sup>3</sup>) p. 15. Burma.  
 And delete  
 49. *L. modesta*, Bruner (cf. no. 38) (entered twice in error).

5. Genus *PROLABIA*, Burr.

As already noted,  
 delete *Labia wallacei*, Dohrn, as a synonym of *P. arachidis*,  
 and bring here

12. *Anisolabis albovittata*, Burr.

Add:—

13. *P. hildebrandti*, Burr, (1912<sup>5</sup>) p. 324, fig. 5. Madagascar.

## Subfamily SPARATTINÆ.

## 4. Genus PARASPARATTA, Burr.

Add:—

- 8.
- P. picadoi*
- , Borelli, (1911
- <sup>2</sup>
- ) p. 3. Costa Rica.

Add:—

## 6. Genus METASPARATTA, Borelli.

for

- 1.
- M. chacoensis*
- , Borelli, (1912
- <sup>1</sup>
- ) p. 3. Argentine.

## Family Chelisochidæ.

## 4. Genus KLEIDUCHUS, Burr.

Bring here

- 2.
- K. malgachus*
- , Borm., from
- Chelisoches*
- .

## 6. Genus PROREUS, Burr.

Add:—

- 8.
- P. delicatulus*
- , Burr, (1911
- <sup>15</sup>
- ) p. 789. S. India.
- 
- 9.
- P. cunctator*
- , Burr, (1911
- <sup>15</sup>
- ) p. 790. S. India.

## 7. Genus CHELISOCHES, Scudder.

- 6.
- C. malgachus*
- , Borm., as noted, is removed to
- Kleiduchus*
- .

Add:—

- 10.
- C. formosanus*
- , Burr, (1912
- <sup>7</sup>
- ) p. 339. Formosa.
- 
- 11.
- C. tigris*
- , Burr, (1913
- <sup>4</sup>
- ) p. 143. N.E. Assam.

## 11. Genus HAMAXAS, Burr.

Bring here from *Spongiphora*:—

- 5.
- H. nigrorufus*
- , Burr.

Add:—

- 6.
- H. kempfi*
- , Burr, (1913
- <sup>4</sup>
- ) p. 144. N. India.

## Family Forficulidæ.

The Chelidurinae and Anechurinae should be fused into one subfamily. The whole group is under rearrangement.

## Subfamily ANECHURINÆ.

## 4. Genus PTERYGIDA, Verhoeff.

The references to pl. vi. figs. 16 a, 16 b, apply to *P. circulata*,

not to *P. jagori*. I have since seen a water-colour drawing of the type of *P. jagori*: the creature is unknown to me, and does not appear to be connected with *Timomenus* at all.

#### 7. Genus ANECHURA, Scudder.

Add:—

17. *A. stoliczkæ*, Burr, (1911<sup>15</sup>) p. 792. N. India.

#### Subfamily FORFICULINÆ.

#### 4. Genus HOMOTAGES, Burr.

This genus should be removed to the Labiinae; in the structure of the tarsi and also of the genital armature of the male, as well as in other features, it comes nearest to *Chaetospania*.

#### 8. Genus HYPURGUS, Burr.

Add:—

1 a. *H. humeralis*, Kirby, var. *vittatus*, Burr, (1911<sup>15</sup>) p. 799. N. India.

#### 9. Genus DORU, Burr.

Add:—

7. *D. leucopteryx*, Burr, (1912<sup>4</sup>) p. 99. Venezuela.

8. *D. platensis*, Borelli, (1912<sup>2</sup>) p. 2. Argentine.

#### 10. Genus GUANCHIA, Burr.

Add:—

6. *G. medica*, Burr, (1911<sup>15</sup>) p. 793. S. India.

7. *G. chirurga*, Burr, (1911<sup>15</sup>) p. 749. Sikkim.

#### 14. Genus FORFICULA, Linn.

I think that 15. *F. ignota*, Burr, and 5. *F. aceris*, Burr, are both mere colour-varieties of 6. *F. beelzebub*, Burr.

No. 10. *F. robusta*, Sem., is obviously identical with *F. scudderi*, Borm., which latter was always regarded as identical with *F. tomis*, Kol. Since Semenoff has shown that the Far Eastern species is distinct, de Bormans' old name *F. scudderi* (1880) must stand, against *F. robusta*, Sem. (1908).

Add:—

42. *F. beebei*, Burr, (1911<sup>15</sup>) p. 295. Himalayas.

Subfamily *NEOLOBOPHORINÆ*.1. Genus *NEOLOBOPHORA*, Scudder.

Add:—

5. *N. insolita*, Borelli, (1911<sup>2</sup>) p. 9. Costa Rica.  
 6. *N. handlirschi*, Burr, (1912<sup>4</sup>) p. 103. Brazil.

Subfamily *ANCISTROGASTRINÆ*.2. Genus *TRISTANELLA*, Borelli.

Add:—

3. *T. inermis*, Borelli, (1911<sup>2</sup>) p. 7. Costa Rica.

3. Genus *SARAKAS*, Burr.

Add:—

4. *S. borellii*, Burr, (1912<sup>4</sup>) p. 105. Peru.

4. Genus *PRAOS*, Burr.

Add:—

3. *P. robustus*, Borelli, (1911<sup>2</sup>) p. 5. Costa Rica.

Subfamily *OPISTHOCOSMIINÆ*.14. Genus *EPARCHUS*, Burr.

Add:—

7. *E. oberthuri*, Borelli, (1912<sup>3</sup>) p. 19. Bhutan.

16. Genus *CORDAX*, Burr.

Add:—

4. *C. politus*, Burr, (1911<sup>15</sup>) p. 798. Burma.  
 5. *C. van kampeni*, Burr, (1913<sup>6</sup>) p. 315. New Guinea.

17. Genus *SYNTONUS*, Burr.

Add:—

2. *S. ? ensifer*, Burr, (1912<sup>4</sup>) p. 107. Peru.

Subfamily *DIAPERASTICINÆ*.1. Genus *DIAPERASTICUS*, Burr.

I have seen the type of *D. cagnii*; it is a brachypterous melanic form of *D. erythrocephalus*.

LXIX.—On the Ceylonese Species of Ruteline Coleoptera belonging to the Genus *Adoretus*. By GILBERT J. ARROW.

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IN my paper on the Rutelinæ of Ceylon, published in the Ann. & Mag. Nat. Hist. for September 1911, I enumerated thirty-one species in all, but reserved the genus *Adoretus* for further consideration later. Previous to the publication of that paper only a single species of the genus had been recorded from the island. Fourteen are now known to me, of which one very widely distributed species, *A. versutus*, Har., is the only one certainly occurring elsewhere. The list of species will no doubt be considerably increased yet, for the genus is evidently peculiarly well represented in Ceylon, although, owing to the generally nocturnal habits of the insects and their inconspicuous colouring and aspect, they have received little attention. Although never of very brilliant or attractive appearance, some of the largest and most striking members of this enormous genus, with the exception of some inhabiting the Madagascan Region, are to be found in Ceylon. They are destructive insects, devouring the leaves of roses, cannas, and other cultivated plants.

The following is the list of the Ceylonese species at present known:—

|                                 |                                |
|---------------------------------|--------------------------------|
| <i>A. mavis</i> , Arrow.        | <i>A. versutus</i> , Har.      |
| <i>A. bicaudatus</i> , sp. n.   | <i>A. feminalis</i> , sp. n.   |
| <i>A. ursus</i> , Arrow.        | <i>A. infans</i> , sp. n.      |
| <i>A. leo</i> , Arrow.          | <i>A. mus</i> , sp. n.         |
| <i>A. ermineus</i> , sp. n.     | <i>A. suturalis</i> , sp. n.   |
| <i>A. rugosus</i> , sp. n.      | <i>A. corpulentus</i> , sp. n. |
| <i>A. singhalensis</i> , Ohaus. | <i>A. celogaster</i> , sp. n.  |

“*Trigonostoma nana*,” Walker, attributed to *Adoretus* in the Munich Catalogue, is a species of *Apogonia*.

The types of the new species here following are in the British Museum. Most of the species were found by Mr. E. E. Green.

*Adoretus bicaudatus*, sp. n.

Brunneus, dense griseo-setosus, elytrorum areis denudatis et densius tectis longitudinaliter alternantibus; pygidio ante apicem bipenicillato: minutus, angustus, toto dense punctatus, opacus, pedibus posticis brevibus, crassis.

Long. 8–10 mm.; lat. 3·5–5 mm.

*Hab.* CEYLON: Trincomali (*E. E. Green*, Sept. 1910); N'munai (*E. E. Green*, May 1909).

A pair from the Pusa Research Institute collection are labelled "Calcutta (*C. E. Preseley*, 12th Oct., 1909)"; but I rather hesitate to accept this locality without further confirmation.

Brown, densely clothed with decumbent grey setæ, which form alternate denuded and densely covered patches upon the elytra. The apical protuberances of the latter are prominent and slightly tufted, and there are two strong tubercles upon the pygidium before the extremity, which bear thick tufts of white setæ.

It is small and narrowly elongate, densely and rugosely punctured above and beneath. The head is large, with prominent eyes and broadly semicircular clypeus. The sides of the pronotum are moderately rounded, the front angles slightly acute, and the hind angles very obtuse. The elytral epipleuræ are not developed. The legs are rather short, the hind pair very short and thick. The front tibia is armed with three short teeth, the uppermost further from the second than that is from the first and separated by a rather sharp notch. The larger claw is minutely cleft in the front and middle feet, and the shorter claw of the hind foot is less than half the length of the longer one. The antennæ are 10-jointed, joints 4 to 6 nearly equal in length.

♂. The teeth of the front tibia are very small. The tufts of the pygidium are very prominent, and there is a well-marked, smooth, denuded area between them and the apex.

*Adoretus ermineus*, sp. n.

Omnino testaceus, supra crebre albo- aut flavo-setosus et squamosus, scutello elytrorumque lateribus et parte apicali densissime squamosis, pygidio dense, corpore subtus magis laxe albo-hirsutis: elongato-ovalis, convexus.  
Long. 12-14 mm.; lat. 5.5-7 mm.

*Hab.* CEYLON: Madulsima (*E. E. Green*); Kalupahani, near Haldummulle.

Testaceous, thickly clothed above with white or pale yellow scaly decumbent setæ, which become gradually more dense towards the hinder part of the elytra, and are extremely dense upon the scutellum and the outer margins of the elytra. The pygidium is densely, and the lower surface of the body and the legs are less densely, clothed with fine hair.

It is elongate-ovate and convex, with a close sculpturing



of the upper surface which is almost hidden by the scaly covering. The clypeus is semicircular, the pronotum moderately rounded at the sides, with the front angles nearly right angles and the hind angles obtuse. The elytral costæ are feeble and the epipleuræ not developed. The front tibia bears three not very strong external teeth, the longer claw is minutely cleft in the front and middle feet, and the shorter claw of the hind foot is less than half the length of the other. The antennæ are 10-jointed, joints 3-5 equal, 6 longer.

♂. The clypeus is small, and the eyes very prominent but not very large. The pygidium is clothed with long erect hairs, which converge to form a pointed cone.

♀. The pygidium has a small depression at its apex, and the hairy covering is not long or erect.

*Adoretus rugosus*, sp. n.

Toto fusco-brunneus, antennis femoribusque flavis; sat dense flavo-setosus, hirtis longioribus interspersis, pygidio pedibus corporeque subtus longe et erecte hirsutis: angustus, parallelus, depressus, supra omnino rugosus, pedibus longis et gracilibus.  
Long. 13.5-14.5 mm.; lat. 6 mm.

*Hab.* CEYLON: Maskeliya (*E. E. Green*, May, August).

Dark brown, with the antennæ and femora yellow. Narrowly elongate and parallel-sided, and moderately closely clothed with rather coarse greyish or yellowish hair, with longer erect hairs interspersed. The pygidium, legs, and lower surface are clothed with rather long upstanding hair. The eyes are exceedingly large and prominent, the clypeus small, semicircular, and granulated, and the forehead and pronotum coarsely and closely punctured, the latter with the sides moderately rounded, the front angles nearly right angles and the hind angles obtuse. The elytra are entirely coarsely rugose, without visible punctures, and with only vague indications of the usual costæ. The pygidium is shining and clothed with long erect hairs. The legs and antennæ are very long and slender, the front tibia armed with three small but sharp teeth, the uppermost one very minute and more distant from the second than that is from the first. The longer claw is cleft upon the front and middle feet, and the shorter claw of the hind foot is about half the length of the longer one. The antennæ are 10-jointed, joints 3-6 very elongate.

♂. The longer claw of the front and middle feet is cleft at a considerable distance from the tip.

This is one of the larger species of *Adoretus*. It has considerable resemblance to *A. singhalensis*, Ohaus, but is larger,

and differs from that and most other *Adoreti* in the rugose elytra, the usual paired rows of punctures and close-set interstitial puncturation being quite absent.

*Adoretus feminalis*, sp. n.

Brunneus, prothoracis lateribus elytrorumque lateribus vel superficie tota flavescentibus; sat breviter ovatus, crebre et minute punctatus, undique regulariter sat dense setosus.

Long. 9.5–10 mm.; lat. 5.5 mm.

*Hab.* CEYLON: Kandy (*Gilles*, 1905); Peradeniya (*E. E. Green*, Nov. 1910); Colombo (*Green*, March 1906).

Brown, with the sides of the pronotum and the sides or the whole of the elytra paler. It is rather short and ovate and entirely clothed with moderately dense, short, uniform greyish setæ. The clypeus is semicircular and granulated, the forehead is strongly and rather rugosely punctured, and the pronotum is short, moderately closely and finely punctured, with the front angles right angles and the hind angles rounded off. The scutellum and elytra are closely and distinctly punctured, the costæ upon the latter are narrow and distinct and the epipleuræ are not continued behind. The pygidium is shallowly pitted or punctured and clothed with setæ, which are erect only at the apical part. The sides of the metasternum are strongly punctured. The front tibia is armed with three acute equidistant teeth, the longer claw of the front and middle feet is cleft, and the shorter claw of the hind foot is more than half the length of the other. The antennæ consist of ten joints, the third to the sixth progressively diminishing in size.

♂. The clypeus is rather small, and the longer front claw is very minutely cleft.

*Adoretus infans*, sp. n.

Pallide testaceus, capite, pronoto tarsisque rufescentibus: elongatus, modice convexus, undique sat crebre griseo-setosus, setis tenuis, haud brevibus, decumbentibus, nonnullis longioribus erectis interspersis; corpore supra fortiter sat crebre punctato, clypeo semicirculari, granulato.

Long. 8.5–10 mm.; lat. 4–4.5 mm.

*Hab.* CEYLON: Eppawela (North Central Prov., *E. E. Green*, Sept. 1905).

Pale testaceous, with the head, pronotum, and tarsi reddish, strongly and closely punctured above, and thickly

clothed with fine, rather long, grey decumbent hairs, interspersed with a few longer erect hairs.

It is elongate and moderately convex, with a large head, very prominent eyes, and semicircular clypeus, which is closely granulated. The forehead and pronotum are deeply and closely punctured, the sides of the latter straight in front and the angles right angles, strongly rounded behind and the angles very obtuse. The elytra are strongly and closely but not rugosely punctured, the costæ rather indistinct and the epipleuræ undeveloped. The pygidium is clothed with long erect hair. The front tibia bears three sharp but not strong equidistant teeth; the longer claw is minutely cleft in the front and middle feet, and the shorter claw of the hind foot is much less than half the length of the longer. The antennæ are 10-jointed, joints 3 and 6 longer than 4 and 5.

♂. The body is much narrower in shape, the eyes larger, and the clypeus smaller than in the female.

*Adoretus mus*, sp. n.

Fuscus, elytris brunneis, femoribus abdomineque subtus plerumque testaceis: minutus, elongatus, setis griseis erectis et decumbentibus æqualiter vestitus, capite minute rugoso, clypeo semicirculari, pronoto modice punctato, elytris rugose punctatis, absque costis; pygidio ubique erecte pubescente.

Long. 5.5-6 mm.; lat. 3 mm.

*Hab.* CEYLON: Diyatalawa (*T. Bainbrigge Fletcher*, Sept. 1908).

Dark brown, with the head and thorax nearly black, and the femora and abdomen beneath generally yellow.

It is a very small narrow-bodied species, moderately thickly clothed with a rather rough grey pubescence, with intermingled erect hairs, the pygidium entirely clothed with long erect hair. The head is finely and closely rugose, the clypeus rather large and semicircular. The pronotum is moderately closely punctured, the front angles slightly and the hind angles very obtuse. The elytra are rugosely punctured and devoid of costæ and of lateral carinæ. The front tibia bears three nearly equidistant teeth, the uppermost feeble and placed near the middle. The longer claw of the front and middle tarsi is minutely cleft, and the shorter claw of the hind tarsus is less than half the length of the longer one. The antennæ are long, the third, fourth, and fifth

joints nearly equal in length, the sixth about twice as long, and the seventh minute.

♂. The antennal club is very long.

I have not seen a female.

*Adoretus suturalis*, sp. n.

Pallide flavus, sutura elytrali late infuscata, prope scutellum paulo dilatata, capite intra oculos prothoracisque disco plerumque etiam infuscatis: elongato-ovatus, modice convexus, undique tenuiter griseo-pubescent, fortiter haud dense punctatus, subnitidus.  
Long. 7.5-9 mm.; lat. 4-4.5 mm.

*Hab.* CEYLON: Wellawaya (*E. E. Green*, Nov. 1905); Diyatalawa (*T. B. Fletcher*, Nov. 1908); Kelani Valley, near Colombo (*W. Braine*); Anaradhapura (low country, Oct. 1911, Calcutta Museum).

Bright yellow, with the elytral suture and usually also the forehead and the middle of the pronotum black or dark brown, the sutural line broad and dilated around the scutellum. The dark patches of the head and thorax are sometimes divided into two collateral masses.

It is elongate-oval, moderately convex, strongly but not densely punctured, somewhat shining and moderately closely clothed with fine grey setæ, not closely decumbent. The clypeus and forehead are coarsely granulated, the pronotum deeply but not densely punctured, with the sides strongly rounded, the front angles nearly right angles, and the hind angles very obtuse. The elytra are strongly punctured, with the costæ indistinct and the epipleuræ not developed. The pygidium is clothed upon its apical part with long erect hair. The front tibia bears three sharp teeth, the uppermost rather nearer to the second than that is to the first. The longer claw is minutely cleft on the front and middle feet, and the shorter claw of the hind foot is extremely small. The antennæ are 10-jointed, joints 3-6 elongate.

♂. The clypeus is narrow and slightly flattened at its front edge, and the eyes are very prominent.

♀. The clypeus is semicircular.

*Adoretus celogaster*, sp. n.

Pallide flavus, clypeo tarsisque solum leviter rufescentibus: ovatus, compactus, subnitidus, minutissime et parce albo-setosus; capite haud dense granulato, clypeo semicirculari, pronoto parce punctato, angulis anticis acutis, posticis nullis; elytris leviter costatis, intervallis irregulariter punctatis; abdominis segmentis ventralibus medio tuberculatis.

Long. 8.5-9 mm.; lat. 4.5-5 mm.

*Hab.* CEYLON: Anuradhapura, low country (Oct. 1911, Calcutta Museum).

Pale yellow, with the clypeus and tarsi alone slightly reddish. Rather broadly ovate and depressed, with the surface shining, and bearing only very sparse and minute white setæ. The head is granulated, but not densely, and the clypeus is semicircular. The pronotum is sparingly punctured, strongly rounded at the sides, with the front angles acute and the hind angles completely rounded off. The elytral costæ are distinct, the intervals not densely punctured and the epipleuræ not evident. The pygidium is clothed with moderately long erect setæ. The abdominal segments, except the first and last, have each a conical protuberance in the middle. The front tibia bears three sharp teeth, the middle nearer to the third than to the first and divided from it by an acute notch. The longer claw is cleft in the front and middle feet, and the shorter claw of the hind foot is more than half the length of the longer one. The antennæ are 10-jointed, the third to fifth joints progressively diminishing, the sixth rather broad.

♂. The clypeus is smaller and the eyes more prominent than in the female. The abdomen is much contracted and narrowed, the ventral tubercles are sharply pointed and that of the penultimate segment large and prominent.

♀. The abdomen is convex, the ventral tubercles are broader and not sharply pointed, and that of the penultimate segment is almost absent.

*Adoretus corpulentus*, sp. n.

Color flavus, clypeo tarsisque solum leviter rufescentibus: breviter convexus, convexus, nitidus, minutissime et parce albo-setosus, punctato, haud dense granulato, clypeo semicirculari, pronoto parce punctato, angulis anticis fere rectis, posticis nullis; elytris sat minute, haud dense punctatis, lineis geminatis distinctis. Long. 8.5–10 mm.; lat. 5–6 mm.

*Hab.* CEYLON: Trincomali (*E. E. Green*, Sept. 1910).

Pale yellow, with the clypeus and tarsi alone reddish, antennæ short and stout, with the surface shining, and bearing only very sparse minute setæ. The head is large and the clypeus rather small, the clypeus semicircular and, with the head, sparingly granulated, and the vertex smooth in the middle. The pronotum is sparingly punctured, the front angles nearly right angles, and the hind angles completely rounded off. The elytra are rather finely but not densely punctured, with distinct double lines of punctures, not

forming costæ. The front tibia is armed with three acute teeth, the uppermost placed about the middle, nearer to the second than that is to the first, and separated from it by an acute notch. The longer claws of the front and middle feet are cleft, and the shorter claw of the hind foot more than half as long as the larger one. The antennæ are 10-jointed, joints 3-7 progressively diminishing in length.

♂. The pygidium is very convex and rather thickly clothed with erect hair.

♀. The pygidium is flat and scarcely pubescent.

This species has a very close resemblance to *A. celogaster*, but the remarkable abdominal processes which form the most distinctive feature of that insect are entirely absent from this. It is also rather more short and rotund, and still paler in colour, and the elytra are smoother, with finer punctures.

LXX.—On the *Burmese Species of Ruteline Coleoptera belonging to the Genus Adoretus*. By GILBERT J. ARROW.

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IN the Ann. & Mag. Nat. Hist. for September 1912 I published descriptions of a series of new species of the genus *Anomala* from Burma. The present paper supplements that one by a similar series of species belonging to the allied genus *Adoretus*, found mainly in the same localities by the same collectors. The types of all are in the British Museum, and co-types are in the Genoa Museum, the Berlin Entomological Museum, and the collection of Mr. H. E. Andrewes.

The following list includes all the species of *Adoretus* at present known to me to inhabit Burma, with the exception of a few of which the specimens yet available are insufficient for the adequate investigation of their characters. For this the male is, in my opinion, absolutely essential. The species will be more fully dealt with in the 'Fauna of British India':—

*A. bombinator*, Burm.  
*A. compressus*, Weber.  
*A. vitticauda*, sp. n.  
*A. coronatus*, Burm.  
*A. caliginosus*, Burm.  
*A. serratipes*, sp. n.  
*A. cribratus*, White.  
*A. birmanus*, sp. n.

*A. parallelus*, sp. n.  
*A. distinguendus*, sp. n.  
*A. pallens*, Bl. (= *nudiusculus*, Sharp).  
*A. nitidus*, sp. n.  
*A. tener*, sp. n.  
*A. epipleuralis*, sp. n.  
*A. limbatus*, Bl.

*Adoretus vitticauda*, sp. n.

Brunneus, leviter metallico-suffusus, setis flavescens decumbentibus inequaliter vestitus, elytrorum maculis densioribus et denudatis longitudinaliter ordinatis fasciculisque ante apicem transverse dispositis, pygidio trivittato.

Long. 9 mm.; lat. 4.5 mm.

*Hab.* TENASSERIM: Papun (Col. Adamson); PEGU: Palon (L. Fea, Sept. 1887): SIAM.

Brown, with the upper surface suffused with a slight metallic lustre, and clothed with unevenly distributed decumbent yellowish setæ, forming longitudinal rows of alternately bare and densely setose spots upon the elytra. Across the apical calli there is a transverse series of tufts of still closer and longer setæ, and the pygidium bears three similar tufts in a transverse row far apart.

It is elongate-oval and not very depressed. The head is closely punctured, with a lightly punctured shining area in the middle of the forehead, and the clypeus is small and semicircular. The eyes are large and prominent. The pronotum is strongly and densely but unevenly punctured, with the sides strongly rounded, the front angles nearly right angles, and the hind angles very obtuse. The scutellum and elytra are closely punctured, and the costæ of the latter almost obsolete. The extremities of the elytra are dark, opaque, and thinly setose, and the calli are prominent. The front tibiæ are broad and sharply tridentate, the hind legs extremely short, and the hind tibiæ inflated. The longer claw of the front and middle feet is very minutely cleft at the apex, and the shorter claw of the hind feet is reduced to a minute vestige. The antennæ are 10-jointed, the fourth and fifth joints short, and the third and sixth longer.

♂. The eyes are larger than in the female. The teeth of the front tibia are sharply pointed, the first and second separated by an acute notch, the third excessively short.

♀. The teeth of the front tibia are strong and close together.

This is nearly related to *A. compressus*, Wiede., but differs in the more conspicuous white tufts at the extremity of the elytra and the pygidium, and also in the toothing of the front tibia, &c.

*Adoretus serratipes*, sp. n.

Omnino fuscus, brevissime æqualiter griseo-setosus, elongatus, convexus, densissime sed haud minute punctatus, clypeo lato, margine

alte reflexo, tibia antica acute 3-dentata, dentibus 2 superioribus remotis, incisura acuta, parteque basali serrato.  
Long. 10·5–12 mm. ; lat. 5–6 mm.

*Hab.* BURMA: Rangoon, Shenmaga, Toungoo (*L. Fea*); Tharrawaddy, Promé, Paungdé (*G. Q. Corbett*); ASSAM: Sibsagar (*G. E. Peal*), Silguri, Cachar (*J. W. Mason*).

In the British Museum, Genoa Museum, Berlin Entomological Museum, and Mr. H. E. Andrewes's collection.

Uniformly dark brown, evenly clothed all over with minute grey setæ, the vertex of the head and the pronotum faintly metallic.

It is moderately elongate and parallel-sided and rather convex. The head is closely rugose, the clypeus large, with its margin semicircular and strongly reflexed. The pronotum is closely but very coarsely punctured, the front angles nearly right angles, and the hind angles almost rounded off. The scutellum and elytra are strongly, densely, and confluent punctured, and the costæ of the latter almost obsolete. The front tibiæ are armed with three sharp teeth, the second and third being divided by a sharp notch and more widely separated than the first and second. Above the uppermost tooth the outer edge is finely serrated. The longer claw of the front and middle feet is cleft, and the shorter claw of the hind foot is more than half the length of the longer. The hind tarsi are short and thick. The antennæ are 10-jointed, joints 2 to 5 progressively diminishing.

The sexes scarcely differ superficially, but the eyes are rather longer in the male.

*Adoretus birmanus*, sp. n.

Fusco-brunneus, prothoracis lateribus, pectore, femoribus, tibiis abdomineque partim flavescentibus, elytris plus minusve pallide aspersis, lateribus plerumque vage pallidioribus: paulo elongatus, parallelus, depressus, setis griseis minutis decumbentibus vestitus, elytrorum setis paulo inæqualiter dispositis, hirtis nonnullis longioribus erectis ad latera rare interspersis; capite lato, clypeo semicirculari, granulato, fronte ruguloso-punctato; pronoto brevi, grosse et crebre punctato, lateribus rotundatis, angulis anticis fere rectis, posticis obtusissimis; elytris dense et rugose punctatis, costis indistinctis.

Long. 11–12·5 mm.; lat. 5–6 mm.

*Hab.* BURMA: Rangoon (*E. T. Atkinson*), Toungoo (*G. Q. Corbett*), Palon (*L. Fea*, Aug. and Sept. 1887).



Var. *flavescens*.

Elytris flavescentibus, vitta suturali obscura, clypeo, pronotique medio et lateribus etiam plerumque pallidis.

*Hab.* Minhla (*Comotto*, 1883).

Dark brown, with the sides of the pronotum, the sternum, femora and tibiæ, and parts of the abdomen yellowish. The elytra are minutely sprinkled with the same colour and the sides generally vaguely paler. It is moderately thickly clothed with decumbent setæ, which are rather unevenly disposed upon the elytra, leaving very minute bare intervals, and there are a very few longer erect setæ near the sides. The body is moderately elongate and parallel-sided, and rather depressed, with the head broad, the clypeus semicircular and finely granulated, and the forehead coarsely punctate-rugose. The pronotum is short, coarsely and closely punctured, with the sides rounded, the front angles nearly right angles and the hind angles very obtuse. The scutellum is strongly punctured, the elytra densely and confluent, and the costæ rather indistinct. The pygidium is finely coriaceous and clothed with rather long erect hair. The antennæ are 10-jointed, joints 3 to 7 regularly decreasing in size. The legs are rather slender, but the hind tarsi a little shortened and thickened. The front tibiæ bear three sharp teeth, the uppermost not reaching the middle, minute and separated by a sharp notch from the preceding one. The longer claw of the front and middle feet is cleft, and the shorter one of the hind foot more than half as long as the other.

♂. The front tibia is much more slender than that of the female and the teeth shorter and sharper, the eyes are larger, the abdomen rather long and distinctly arched, and the pygidium very prominent and convex.

♀. The form is shorter and less parallel-sided, the eyes are smaller, the abdomen is short and very convex, and the pygidium almost concealed.

Var. *flavescens*.—The elytra are yellow, except a vaguely defined dark sutural stripe of varying size, and the clypeus and the middle, as well as the sides, of the pronotum are generally pale also.

The specimens of this variety, of which I have seen a considerable series taken by *Comotto* at Minhla, are all of rather smaller size than the typical form.

*Adoretus parallelus*, sp. n.

Toto rufo-brunneus, setis griseis decumbentibus undique sat dense vestitus, elytrorum hirtis nonnullis erectis postice rare sparsutis: elongatus, parallelus, depressus, crebre punctato-rugulosus, tibia antica breviter tridentata, dentibus 2° et 3° incisura acuta separatis.

Long. 11·5–12·5 mm.; lat. 5 mm.

*Hab.* BURMA: Rangoon (*E. T. Atkinson*); Tharrawaddy, Promé (*G. Q. Corbett*), Tikekei (*L. Fea*, June 1884).

Entirely brownish red, densely clothed with greyish decumbent setæ, with a very few isolated erect hairs near the sides of the elytra.

It is elongate, parallel-sided, and depressed.

The eyes are very large and the head finely granulated in front and densely rugulose behind, the clypeus small, broadly semicircular, with the margin strongly reflexed. The pronotum is very short, uneven, and finely rugulose punctured, with its sides gently rounded, the front angles blunt and the hind angles indicated but almost rounded off. The scutellum is finely punctured and the elytra finely rugosely punctured, with the costæ narrow and inconspicuous. The pygidium is coriaceous and clothed with rather long erect hairs. The antennæ are 10-jointed, joints 3 to 6 being elongate and nearly equal. The front tibia is long and armed with three sharp teeth, occupying less than half its length. The second and third teeth are farther apart than the first and second, and are separated by a sharp notch. The longer front and middle claws are minutely cleft, and the shorter claw of the hind foot is more than half as long as the other. The hind tibia is a little contracted at the end.

I have not seen the ♀.

It is very near *A. cibratus* and *distinguendus*, but easily recognized by the sharp notch separating the two upper teeth of the front tibia.

*Adoretus distinguendus*, sp. n.

Flavescens, tarsis, capite pronotoque utrinque obscurioribus, sat dense æqualiter pubescens, pygidio longe et erecte hirsuto: depressus, elongatus, fere parallelus, capite lato, dense granulato, clypeo semicirculari, pronoto brevi, fortiter sat crebre punctato, angulis anticis fere rectis, posticis rotundatis.

Long. 12 mm.; lat. 5 mm.

*Hab.* BURMA: Tharrawaddy (*G. Q. Corbett*).

Testaceous, with the tarsi, head, and an ill-defined patch

on each side of the middle line of the pronotum reddish; fairly closely clothed with uniform short setæ, except upon the pygidium, which bears rather long erect hair.

It is elongate, rather parallel-sided, and depressed. The eyes are large and prominent, the head closely granulated except upon the vertex, which is strongly punctured, and the clypeus is short and transverse. The pronotum is very short, strongly and closely punctured, strongly rounded at the sides, with the front angles nearly right angles and the hind angles entirely rounded off. The scutellum and elytra are strongly and closely punctured, the costæ of the latter moderately distinct. The antennæ are 10-jointed, joints 3 to 7 regularly diminishing in length. The front tibia bears three strong teeth, the second nearer to the terminal one than to the third, and the longer claw of the front and middle feet is cleft.

It is closely related to *A. cribratus*, White, and *A. birmanus*, but differs from both in having the hind angles of the pronotum completely rounded off. The pronotum is also less densely punctured than that of *A. cribratus*.

I have seen two males only. One of them is in Mr. H. E. Andrewes's collection, the other has been given by him to the National Collection.

*Adoretus nitidus*, sp. n.

Pallide flavus, nitidus, clypeo tarsisque rufis, vertice fere nigro: minute et sparse griseo-setosus, valde elongatus, paulo convexus, capite transverse ruguloso, clypeo minus dense, hoc semicirculari, margine fortiter reflexo; pronoto grosse et parce punctato; elytris sat dense punctatis; pygidio coriaceo.

Long. 10–11 mm.; lat. 5 mm.

*Hab.* BURMA: Mandalay (*H. L. Andrewes*, June), Minhlá (*Comotto*, 1883).

Pale yellow, with the tarsi and clypeus red and the vertex of the head nearly black; thinly clothed with minute greyish setæ. Very long and cylindrical, with the head not very wide and the clypeus relatively moderately large, the latter semicircular, with strongly reflexed margin. The head is transversely rugulose, the clypeus rather laxly. The pronotum is coarsely but very scantily punctured (a little more closely at the sides), with the lateral margins strongly rounded, the front angles acute and the hind angles completely rounded away. The scutellum is sparingly punctured and the elytra moderately strongly and closely, with not very well-marked costæ. The pygidium is finely coriaceous and clothed with short erect setæ. The front tibia is armed with

two strong but not very sharp teeth, and a third which is minute and stands beyond the middle, but nearer to the second than that is to the first. The tarsi are rather slender and the claws not very long, the longer front and middle ones cleft, and the shorter one of the hind foot more than half the length of the other. The antenna is 10-jointed.

♂. The longer front and middle claws are minutely cleft at a little distance from the tip, and the pygidium is large and convex.

♀. The pygidium is very short and the abdomen very convex.

*Adoretus tener*, sp. n.

Pallide flavus, setis albidis parce vestitus, elytrorum setis in seriebus longitudinalibus sat remotis ordinatis: breviter ovatus, sat convexus, nitidus, capite haud dense granulato, clypeo semicirculari, margine fortiter elevato, oculis remotis, haud magnis; pronoto brevi, parce punctato, lateribus fortiter arcuatis, angulis anticis acutis, posticis obsoletis; scutello et elytris crebre sat minute punctatis, nitidis, costis parum distinctis; pygidio minute punctato, parce sat longe hirsuto, tibiis anticis acute 3-dentatis, dentibus incisura acuta divisus, tarsis gracilibus.

Long. 8·5–9·5 mm.; lat. 4·5–5 mm.

*Hab.* TENASSERIM: Victoria Point (*E. T. Atkinson*, Aug. 1887).

Pale yellow, shining, and thinly clothed with minute whitish setæ, those on the elytra arranged in not very close longitudinal lines.

It is very short and stout in form and moderately convex. The head is not very broad nor the eyes very large. The clypeus is prominent, semicircular, with very strongly raised margin, and moderately sparingly granulated. The pronotum is short, rather sparingly punctured, with strongly rounded sides, acute front angles and hind angles completely rounded away. The scutellum and elytra are rather closely but not coarsely punctured, and the costæ upon the latter are not strong. The pygidium is finely punctured and thinly clothed with moderately long hair. The front tibia is armed with three short teeth, divided by acute notches, the third tooth placed about the middle of the tibia and nearer to the second than that is to the first. All the tarsi are slender, the longer claw of the front and middle feet is cleft, and the shorter claw of the hind foot is more than half the length of the longer one. The eyes of the male are larger than those of the female.

*Adoretus epipleuralis*, sp. n.

Flavus, capite tarsisque rufis, vertice fere nigro, sparse et minute setosus, sat nitidus, pygidio longe haud dense hirsuto; breviter ovatus, convexus, elytrorum epipleuris fere integris, postice dilatatis, opacis.

Long. 10·5–11·5 mm.; lat. 5·5–6 mm.

*Hab.* BURMA: Tharrawaddy, Toungoo (*G. Q. Corbett*).

Pale yellow, with the head and tarsi red and the vertex nearly black, thinly clothed with minute, sparse, erect setæ, which are very inconspicuous. The pygidium is clothed with rather long erect hairs. It is short and broad in form and rather convex, and the surface is shining. The head is finely rugose and the clypeus broad, with its margin regularly rounded and strongly elevated. The pronotum is strongly but not closely punctured, rather short, with the front angles acute and the hind angles completely rounded off. The scutellum and elytra are also strongly but not closely punctured; the costæ of the latter are moderately distinct, and the epipleuræ are continued almost to the extremities, being narrow in the middle but conspicuously dilating behind, where they are smooth and opaque. The legs are rather long and slender, the front tibia armed with three rather long teeth, which occupy more than half its length. The longer claw is rather deeply cleft in the front and middle feet, and the shorter one of the hind foot is more than half the length of the other. The antennæ are 10-jointed, the third to seventh joints regularly diminishing.

♂. The clypeus is shorter than that of the female, and the pygidium is large and convex.

♀. The pygidium is short and flat.

*A. epipleuralis* is very closely related to *A. renardi*, Brenske, but the clypeus is shorter and broader, the hind angles of the pronotum are completely rounded off, and the clothing of the upper surface is more scanty, being so thin that a smooth shining appearance is produced.

## BIBLIOGRAPHICAL NOTICES.

*Catalogue of the Lepidoptera Phalaenæ in the British Museum.*  
Vols. XII. and XIII. By Sir GEORGE F. HAMPSON, Bart.  
London: Printed by Order of the Trustees, 1913.

Vol. XII. pp. i–xiii & 1–626, plates cxcii.–ccxxi., 383 col. figs.

In this volume six hundred and forty-three species belonging to the Noctuid subfamily Catocalinæ are considered. These species, of which over seventy are new to science, are distributed among

sixty-three genera. The genus *Catocala*, Schrank (type *fraxini*, Linn.), as here restricted, has only eighty-six species assigned to it. The majority of the species hitherto referred to *Catocala* being removed to *Catabapta*, Hulst (type *antinympa*, Drury), and *Ephesia*, Hübn. (type *fulminea*, Scop.).

*Eunetis*, Hübn. (type *puerpera*, Giorna), *Lamprosia*, Hübn. (type *amatrrix*, Hübn.), and *Eucora*, Hübn. (type *neonympha*, Esp.), are all merged in *Catocala*, Schrank, but the two species last named are entered and described under *Mormonia*, Hübn. (type *epione*, Drury).

*Suffumosa*, Guen., = *retorta*, Cram., is given as the type of *Spirama*, Guen., which, together with *Hypopyra*, Guen. (type *triloba*, Guen.), are included in *Speiredonia*, Hübn. (type *retorta*, Linn.). Some of the species referred by authors to *Hypopyra* are now placed in *Enmonodia*, Walk. (type *prudens*, Walk.), which includes *Maxula*, Walk. (type *unistrigata*, Guen.), and *Pyramarista*, Kirby (type *rufescens*, Kirby).

Many species previously included by authors in *Ophisma*, Guen., are now placed in *Achæa*, Hübn. (type *melicerta*, Drury).

*Minucia*, Moore, = *Ophiodes*, Guen. (preoc.), comprises but two species; these are *wiskotti*, Püng., and *lunaris*, Schiff. (type). Other species previously referred to *Ophiodes* are here removed to *Anua*, Walker (type *finifascia*, Walker).

*Dysgonia*, Hübn. (type *joviana*, Stoll), *Navia*, Guen. (type *absentimacula*, Guen.), *Pasipeda*, Moore (type *palumba*, Guen.), *Caranilla*, Moore (type *onelia*, Guen.), and *Pindara*, Moore (type *illibata*, Fabr.), are all sunk in *Parallelia*, Hübn. (type *bistriaris*, Hübn.). In this connection it may be noted that most of the species described by authors under *Ophiura* are here included in *Parallelia*. *Ophiura* is a genus belonging to a later subfamily of the Noctuidæ.

Vol. XIII. pp. i-xiv & 1-609, plates ccxxii.-ccxxxix., 455 col. figs.

Deals with the remainder of Catocalinæ and also with the subfamilies Mominæ and Phytometrinx.

Of Catocalinæ forty-six genera (fifteen new) and three hundred and seventy-nine species are treated, thus extending the totals of genera and species belonging to the subfamily to one hundred and nine, and one thousand and twenty-two respectively. The largest genera in this section are *Safia*, Guen. (53 sp.), *Zale*, Hübn. (49 sp.), and *Mocis*, Hübn. (31 sp.).

In *Mocis* are included *Pelemia*, Guen. (type *phasaianoides*, Guen.), *Remigia*, Guen. (type *frugalis*, Fabr.), *Baratha*, Walk. (type *disseverans*, Walk.), and *Carninda*, Moore (type *undata*, Fabr.).

"*Catephia*" *trifasciata*, an Australian species described by Stephens as a British insect (Ill. Brit. Ent. Haust. vol. iii. p. 128), is referred to *Mocis*. *Lunata*, Drury, is the type of *Phæocyma*, Hübn., also of *Omopterus*, Boisd., and of *Homoptera*, Guen. All these, together with *Xylis*, Guen. (type *setipes*, Guen.), are merged in *Zale*, Hübn. (type *horrida*, Hübn.).

*Euclidia*, Hübn., Tent., is rejected, and as *fixa*, Fabr., has been ascertained to be the type of *Euclidia*, Treit., the latter name will take precedence over *Synthymia*, Hübn. (Acronyctinæ, vol. ix.

p. 372); the species usually referred to *Euclidia* are here assigned to *Euclidimera*, Hampson (type *mi*, Clerck), and *Gonospileia*, Hübn. (type *munita*, Hübn.). *Glyphica*, Linn., is included in the last-named genus, and *cerulea*, Grote, in *Euclidimera*. *Sobria*, Walk., which Dyar cites as a synonym of *erichtea*, Cram., under *Drasteria*, Hübn., is removed to *crassiuscula*, Haw., and placed in *Cænurgia*, Walk. (type *convalescens*, Guen.).

The subfamily Momiinæ comprises only seventy-four species and eleven genera. Of the latter *Elceodes* (type *brevicornis*, Walk.) and *Elydnodes* (type *variegata*, Leech) are new.

*Coryli*, Linn., the type of *Demas*, Steph., is also the type of *Calocasia*, Hübn. As the latter has two years' priority, it has been adopted. *Cænobita*, Esp., is the type of *Diphthera*, Treit. (1825), and also of *Panthea*, Hübn. (1827); the former name has precedence. It may be noted here that *alpinum*, Osbeck, = *orion*, Esp., so frequently referred by authors to *Diphthera*, Hübn., has been transferred to *Daseocheta*, Warren, a genus belonging to the subfamily Acronyctinæ (Phal. vol. viii. p. 30).

Phytometrinæ: two hundred and twenty-six species, distributed among fifteen genera (three new), are considered under this subfamily heading.

The bulk of the species hitherto referred to *Plusia* are here placed in *Phytometra*, Haw. *Amethystina*, Hübn., is noted as the type of *Plusia*, Treit. (1826), and therefore takes precedence over *Telesilla*, H.-S., a genus in Acronyctinæ (Phal. vii. p. 587).

*Polychrysia*, Hübn. (type *moneta*, Fabr.), is merged in *Chrysoptera*, Latr. (type *c-aureum*, Knoch, = *concha*, Fabr.).

The last genus in this subfamily is *Episema*, Treit., of which *cæruleocephala*, Linn., is the type and sole known species.

Sir George Hampson has formed his conclusions as to the relationship of families, genera, and species on a study of the venation and other external characters of the imago. Possibly therefore his classification of the Lepidoptera Phalænæ may not find unchallenged acceptance. The fact, however, remains that, considering the present state of knowledge concerning the early stages of the bulk of the species, classification must be based almost entirely on imaginal characters. Changes no doubt will be necessary as time progresses, but, whatever these may be, we cannot conceive that they will in any way lessen the importance or impair the excellence of the 'Catalogue.'

The scope of the work is far more comprehensive than is suggested by its title. Not only is almost every species known to science described, but, where necessary, figured in the atlas. Synonymy and references are cited, and geographical distribution adequately dealt with.

The arrangement of the Phalænæ in the British Museum Collection being exactly that shown in the Catalogue, it follows that the latter affords a very convenient clue to the position in the collection of any family, genus, or species one may wish to study.

Thirteen volumes of the Catalogue have now been published

since 1898, the year in which Vol. I., dealing with the Syntomidæ, was issued. Vol. II., treating of the Arctiadæ (subfamilies Nolinæ and Lithosianæ), followed in 1900. Arctianæ (third subfamily of Arctiadæ) formed the subject of Vol. III., which appeared in 1901. The volumes dealing with the Noctuidæ were issued as follows:—Vol. IV. Agrotinæ (1903); Vol. V. Hadeninæ (1905); Vol. VI. Cucullianæ (1906); Vols. VII., VIII., & IX. Acronyctinæ (1908–1910); Vol. X. Erastrianæ (1910); Vol. XI. Eutelianæ, Stictopterianæ, Sarrothripinæ, and Acontianæ (1912).

*The Pliocene Mollusca of Great Britain, being supplementary to S. V. Wood's Monograph of the Crag Mollusca.* By F. W. HARMER, F.G.S., F.R.Met.S. Part I.: pp. 1–200, pls. i.–xxiv. (The Palæontographical Society.) February 1914.

THIS is a valuable addition to our knowledge of the Crag Molluscan fauna of this country, and is intended to form a supplementary account to Searles Wood's monograph on the same subject, published many years ago by the Palæontographical Society. The memoir commences by noticing the various non-marine shells found in the Crag, which are divided into the groups of "Terrestrial" and "Aquatic." Some 48 species are referred to, of which 13 are considered to be extinct; they are of most frequent occurrence in the Norwich Crag, less so in the Red Crag, while only 3 are known in the Coralline Crag—information which is usefully summarised in a "Distribution Table." We note that Studer's genus *Pomatias* (type = *Nerita elegans*, Müller) is adopted for Lamarck's *Cyclostoma* of a later date, the subject being mentioned as if it were quite recently inspired, whereas Mr. R. Bullen Newton pointed out more than 20 years ago (Ann. & Mag. Nat. Hist. 1891, ser. 6, vol. vii. p. 346) that it was essential to recognize that name in conchological nomenclature. The marine mollusca are next considered, much new material having been obtained from the Red Crag deposits of Little Oakley near Harwich, between Walton-on-Naze and Felixstowe, representing a littoral and southern fauna with some northern species, the beds being regarded as of "Waltonian" age, which is stated to be partly equivalent to the Poderlian stage of the Belgian Pliocene deposits. Varietal names, which already burden our conchological literature, are largely resorted to, no less than a dozen being used in connection with *Buccinum undatum*—far better would it have been to raise the chief of these to specific rank and to have ignored those of lesser importance.

We notice that the terms Miocene and Pliocene are frequently quoted in connection with the geological distribution of the species, although it is advisable to define more particularly, when able, the actual stage of those periods, such as Vindobonian, Plaisancian, &c. In glancing at the generic names employed, we observe those attributed to Klein and Adanson, both pre-Linnæan authors, as also others which have been pre-occupied in different sections of zoology, among which we would call attention to the following:—

TEREBRA of Adanson, *pre-Linnæan*,  
= Lamarck, 1799.



PURPURA of Adanson, *pre-Linnean*,

= Bruguière, 1789.

TRITON, Montfort, 1810, *non* Linnæus (Cirripedia),

= LAMPUSIA, Schumacher, 1817.

MEYERIA, Dunker & Metzger, 1878, *non* M'Coy (Crustacea), 1849.

= METZGERIA, Norman, 1879.

SIPHO, Klein, *pre-Linnean*, adopted by Moreh in 1852.

= TRITONOFUSUS, Beck, 1847, see Harris, Cat. Australasian Tertiary Mollusca, British Museum, 1897.

The work will be of great service to the student on account of the beautiful plates which illustrate the different species. Recent and fossil forms are placed side by side, so that comparisons are easily followed out. This is only the first portion, running to 200 pages and 24 plates, containing the non-marine shells and marine Gastropoda—we shall look forward with interest to succeeding parts of so important a guide to the Crag Mollusca of this country.

## PROCEEDINGS OF LEARNED SOCIETIES.

### GEOLOGICAL SOCIETY.

February 4th, 1914.—Dr. Aubrey Strahan, F.R.S., President, in the Chair.

The following communication was read:—

‘On the Occurrence of a Giant Dragon-Fly in the Radstock Coal Measures.’ By Herbert Bolton, M.Sc., F.R.S.E., F.G.S., Reader in Palæontology in the University of Bristol.

The writer describes the structure of a wing-fragment found some years ago upon the Tyning waste-heap at Radstock Colliery (Somerset) by Dr. E. A. Newell Arber, F.G.S.

The fragment consists of the proximal third of a left fore-wing. It is remarkable for its size, being 64 mm. long and 40 mm. broad, the complete wing having an estimated length of 190 mm., or 7·5 inches; the whole insect (with wings extended) must have had a span of over 400 mm., or 16 inches.

The anterior wing-margin is strongly tuberculated proximally, and more distally bears a closely-set series of pointed spines directed outwards towards the wing-apex. The hinder wing-margin is also spinous, the spines being a little way inwards from the edge, and possibly serving to interlock the fore and hind wings during flight. The radial and median veins are missing, but the characters of the costa and subcosta on the anterior portion of the wing, and of the cubital and anal veins on the hinder part, show clearly the close relationship of the insect to the members of the family Meganeuridæ, a group including the enormous *Meganeura monyi* Brongniart, from the Stephanian of Commentry (Allier). The wing is referred to the genus *Meganeura* as a new species. The precise horizon from which the shale was derived cannot be determined, as the Tyning waste-heap has received material from five different collieries.

February 25th, 1914.—Dr. A. Smith Woodward, F.R.S., President, in the Chair.

The following communication was read:—

‘Correlation of Dinantian and Avonian.’

By Arthur Vaughan, M.A., D.Sc., F.G.S.

The present paper records the results of applying the time-scale deduced from the South-Western Province to the Belgian sequence, and shows that the faunal succession is practically the same in both provinces. Even the specialized and locally exaggerated facies which form so striking a feature of the Belgian Province (such as the ‘petit granit,’ the ‘Waulsortian,’ and the ‘*sublævis* oolite’) have been discovered at certain points of the South-Western Province, and they are adumbrated at many others. [If, furthermore, we extend our researches and compare the Midland and Northern developments of England and Wales with that of Belgium, striking identities are observed; for example:—

The ‘Brachiopod Beds’ of the Midlands and of Visé are identical.

The lower ‘knolls’ of the Clitheroe area are typical ‘Waulsortian.’]

The following are the most important conclusions from the Author’s work in Belgium:—

### I. Physiographical Phenomena.

The lateral variation of Mid-Avonian lithology is strikingly exhibited in a diagram. Minute correlation of the Belgian sequence with that of the South-Western Province demonstrates that the periods of partial emergence—of the west of the South-Western Province and of the east of the Belgian Province—took place consecutively and not simultaneously, namely: in the South-Western Province at the close of  $C_1$ -time, in Belgium at the beginning of Viséan time. At the latter period, England and Wales, outside the South-Western Province, had sunk below the Carboniferous sea. [Simultaneously, however, Ireland was, like Belgium, under emergent conditions.]

### II. Palæontological Phenomena.

The palæontological section contains descriptions of several genres that are common in Belgium, but rare in Britain. The most interesting portion of the section is, however, that which deals with the evolution of the important Carboniferous corals and brachiopods. Two illustrations were selected, and were shown as lantern-slides:—

- (i) Phylogenetic history of *Caninia cylindrica*.

Belgium only.  $\left\{ \begin{array}{l} K. \textit{Endophyllum}, \\ Z. \textit{Caninia hastierensis} \text{ (Endophylloid)}. \end{array} \right.$

Migration into Britain at  $\gamma$ —*C. cylindrica*, mut.  $\gamma$ .

Britain and Belgium ...  $\left\{ \begin{array}{l} \delta \text{ and } S \text{—mature (Campophylloid) } \textit{Caninia}. \end{array} \right.$

- (ii) Fragments of the history of *Spiriferina octoplicata*, showing variation of relative strength of ribs (departure from normality of early stages)—the essential characters fixed.

These facts concerning migration and evolution are, unquestionably, the most important results of extending the area of observation.

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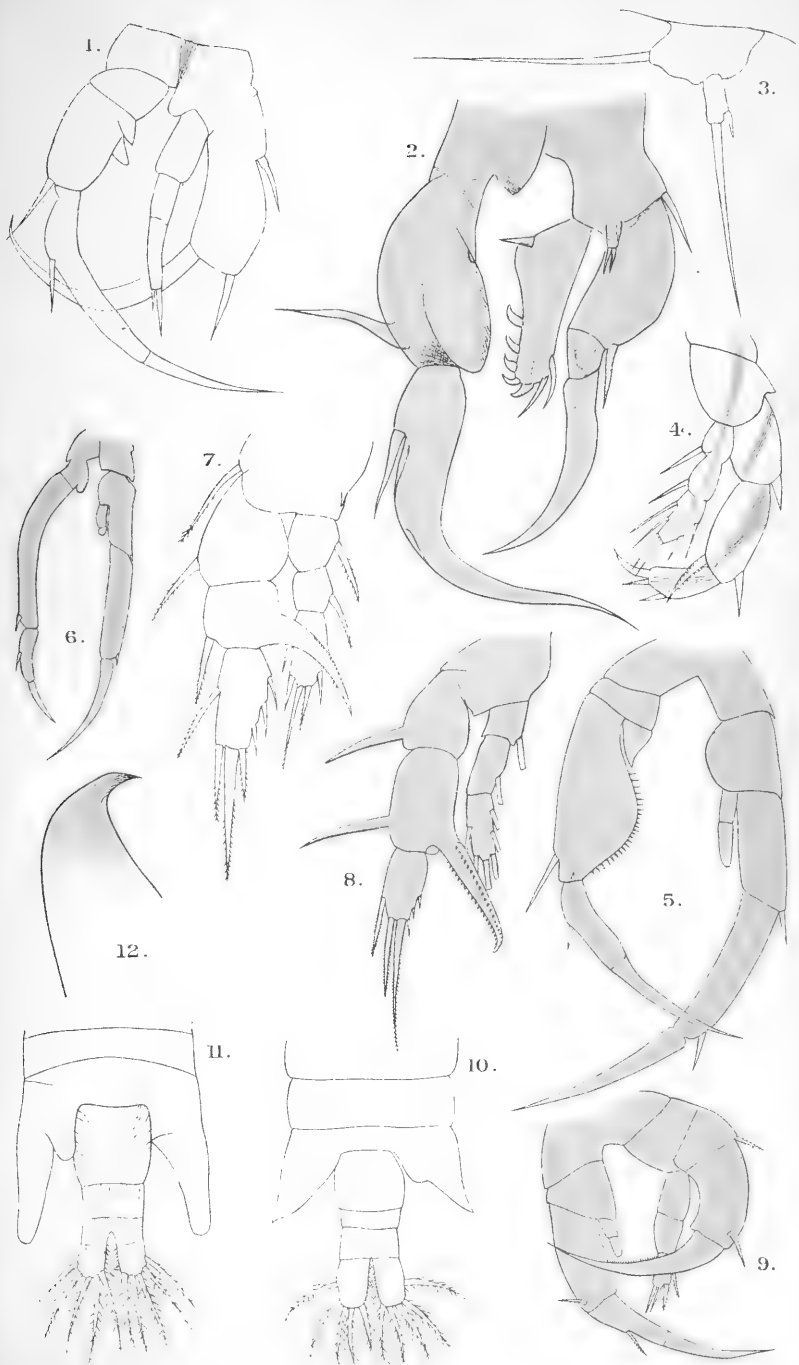
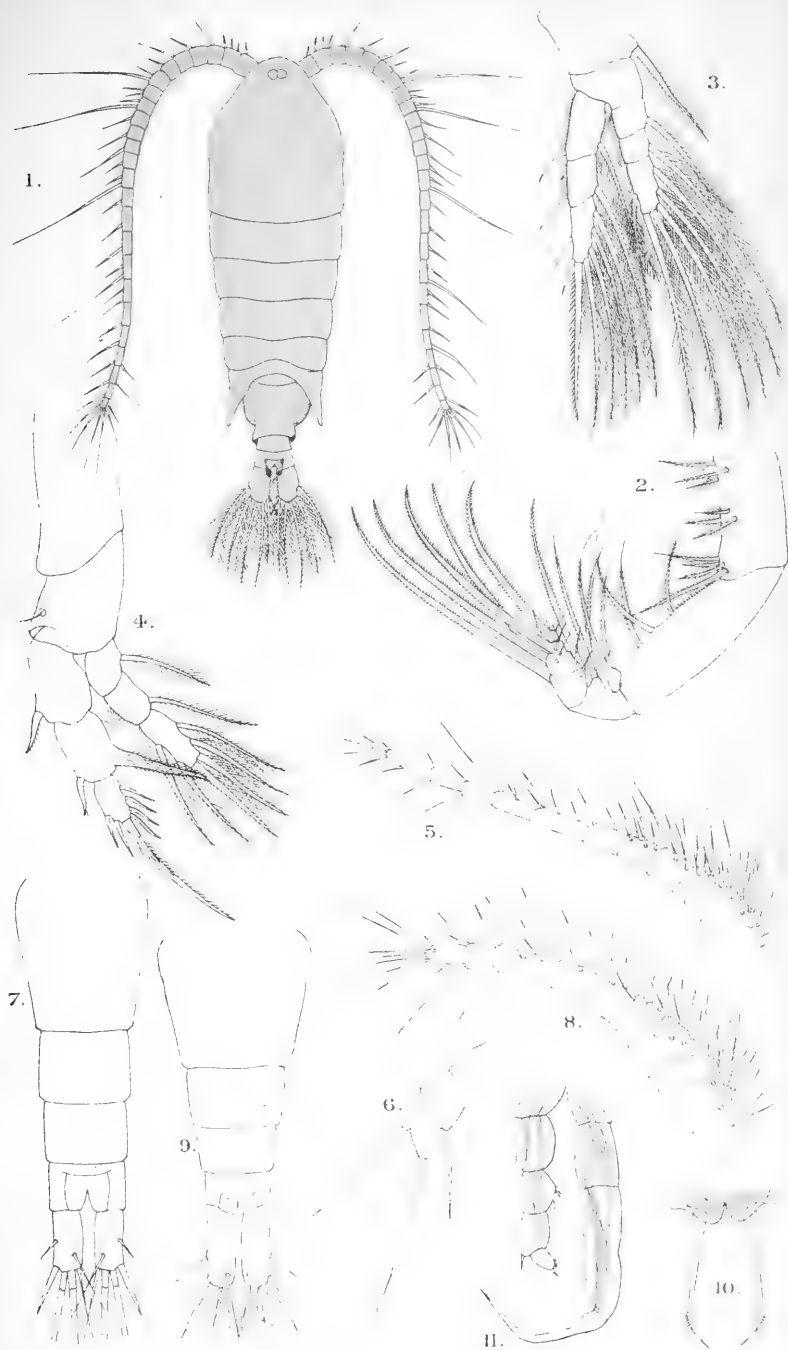


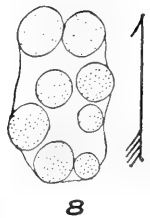
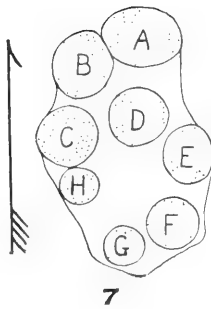
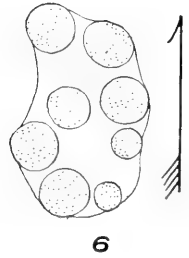
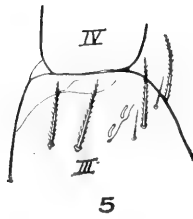
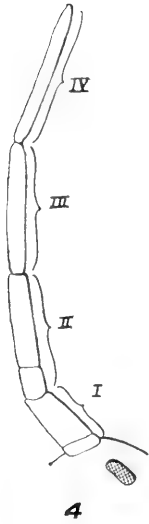
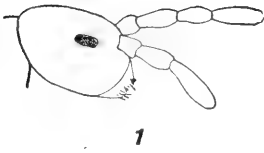
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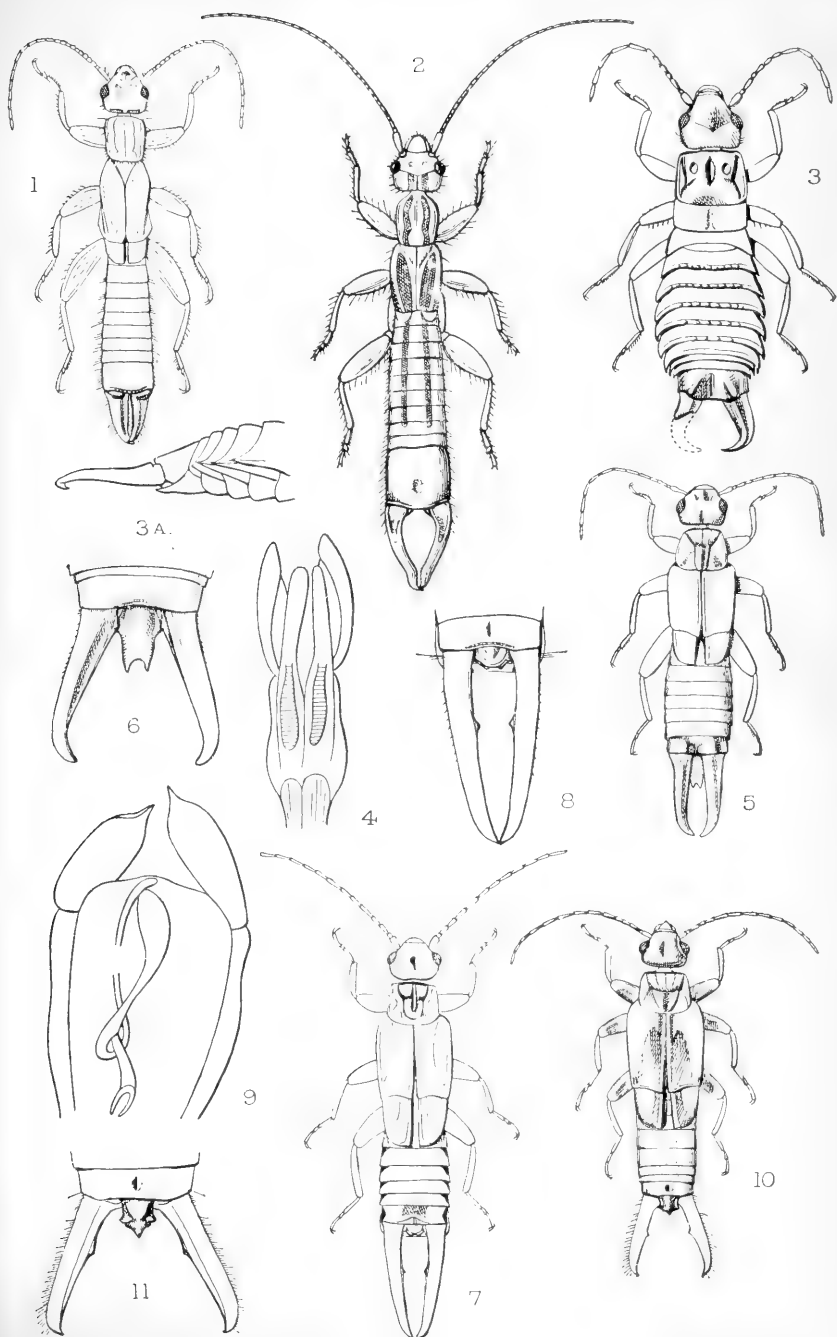


Figs. 10 & 11. T. Scott, del.  
others A. Scott, del.











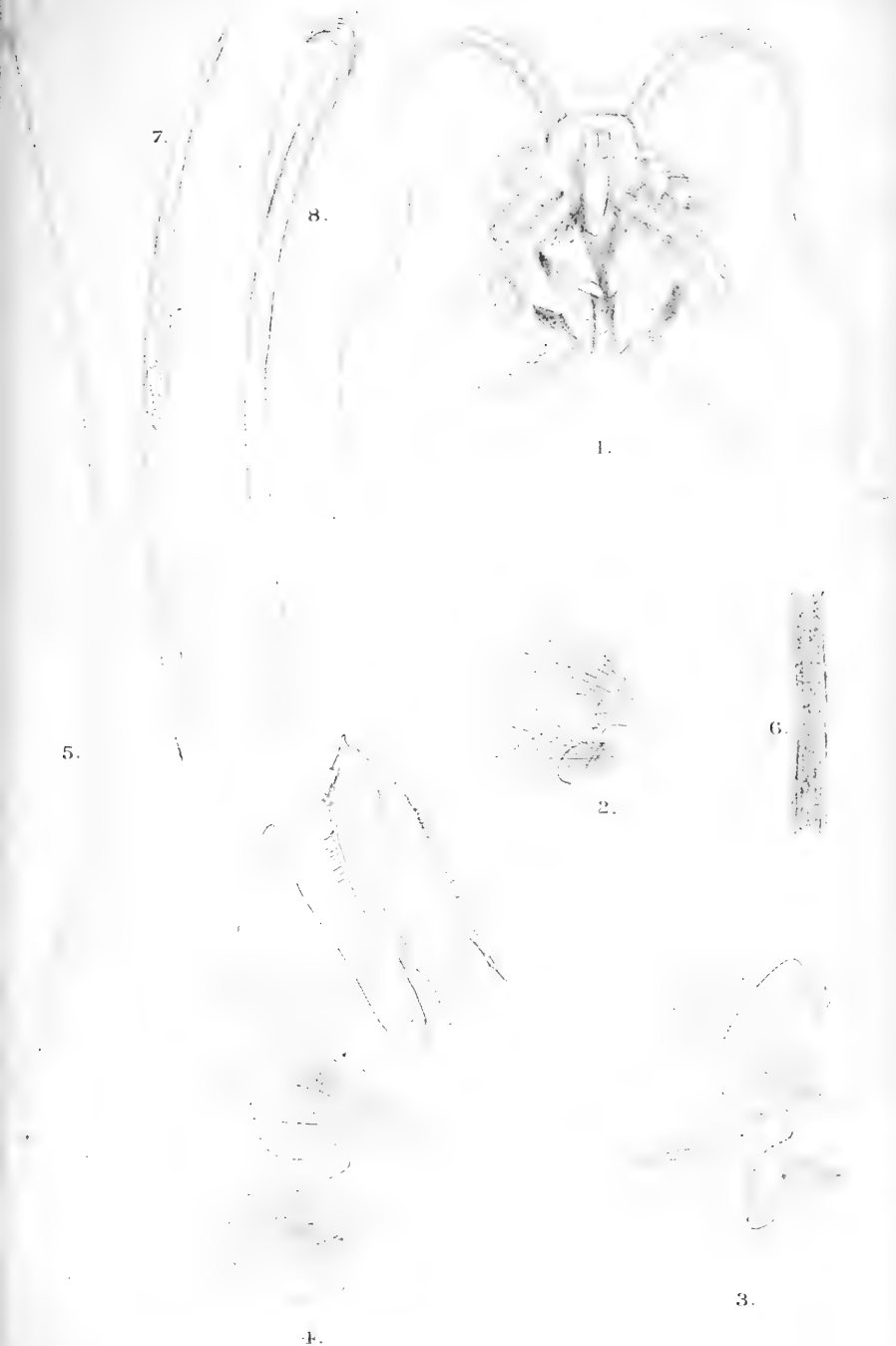


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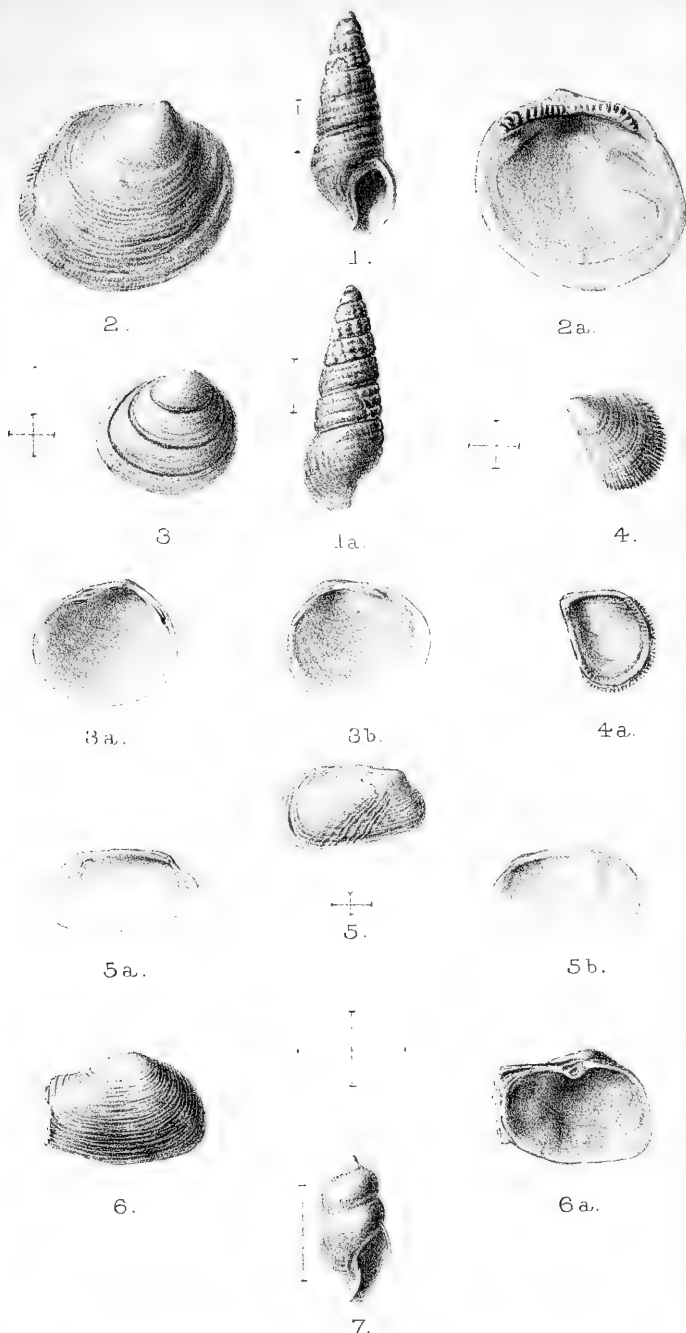


Photo of Lesser Rorqual, lying on its right side, 17 Nov., 1913.











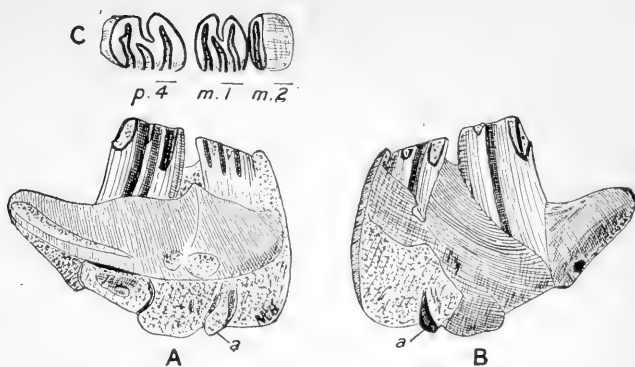


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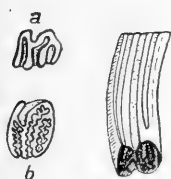


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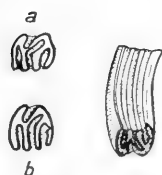


Fig. 3.



Fig. 4.



Fig. 5.



Fig. 6.

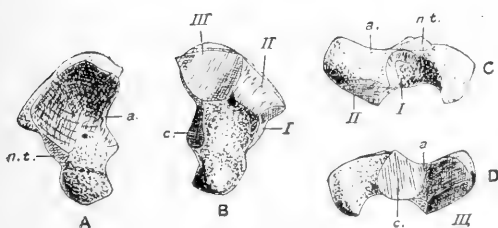


Fig. 7.

Fig. 6 (b).



Fig. 6 (a).

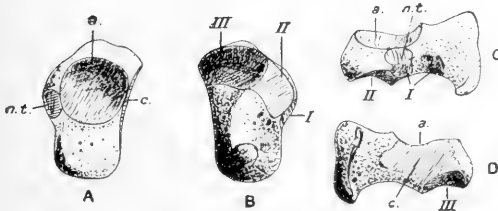


Fig. 8.



Fig. 10.

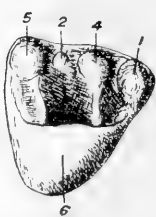
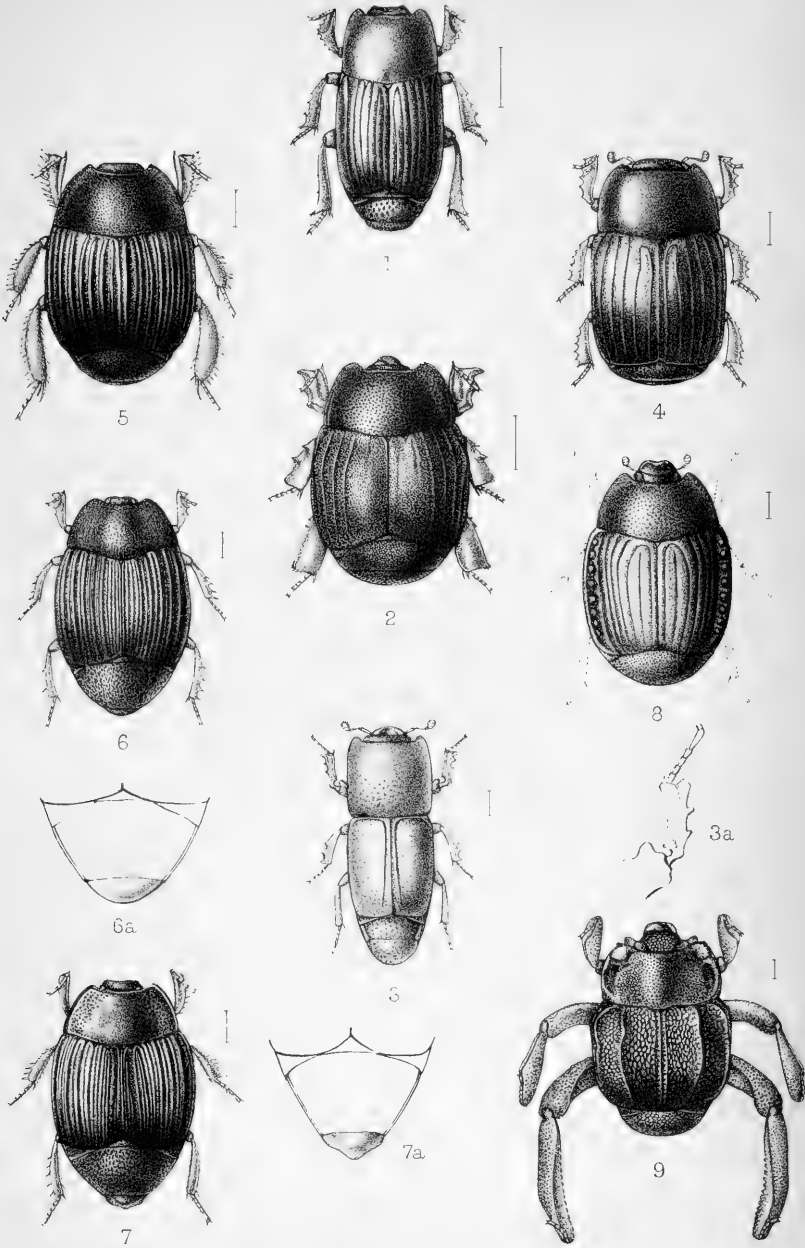


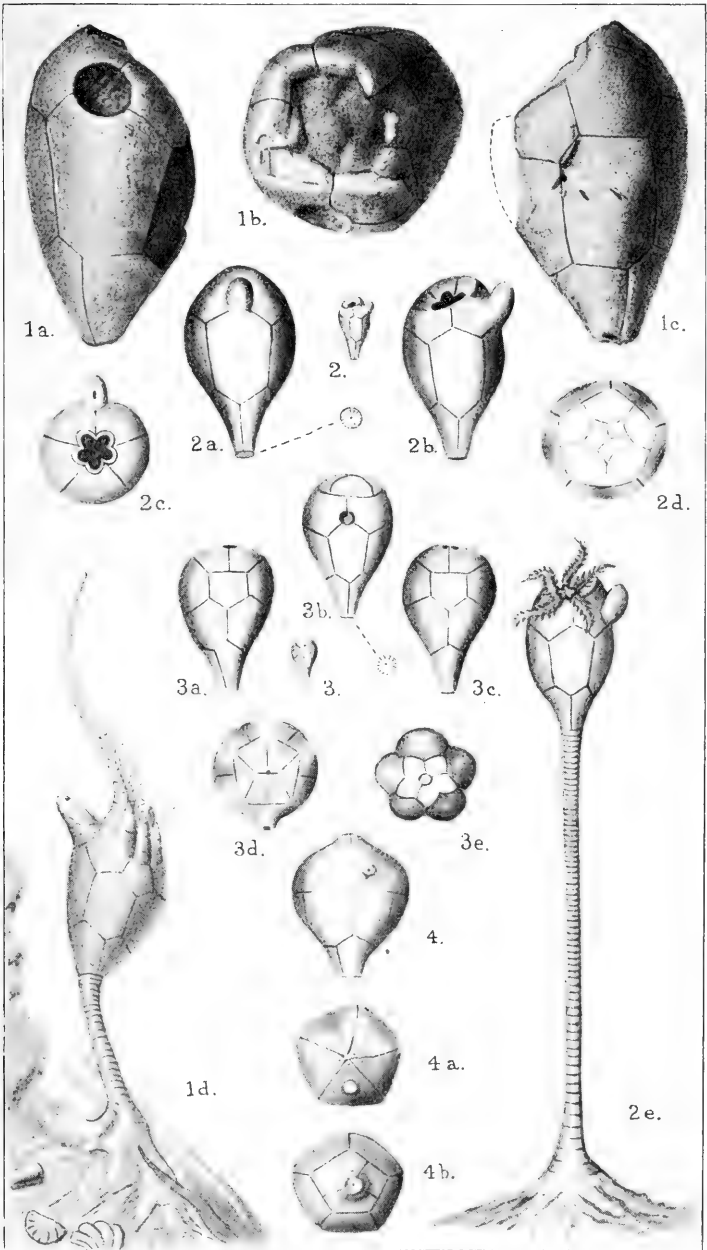
Fig. 9.









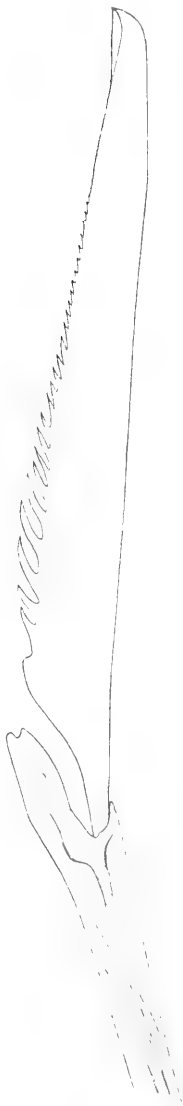


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*Fig. 1.*

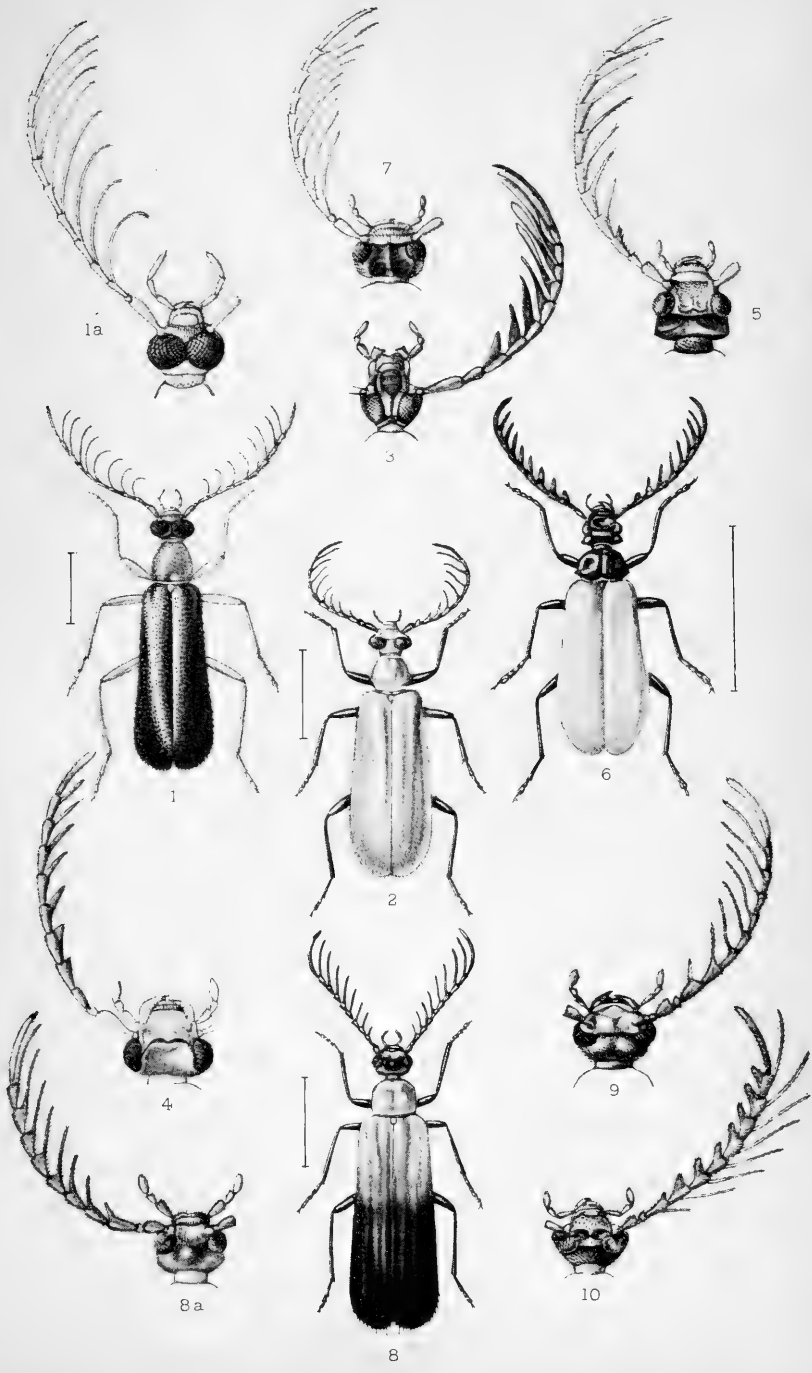


*Fig. 2.*



*Fig. 3.*



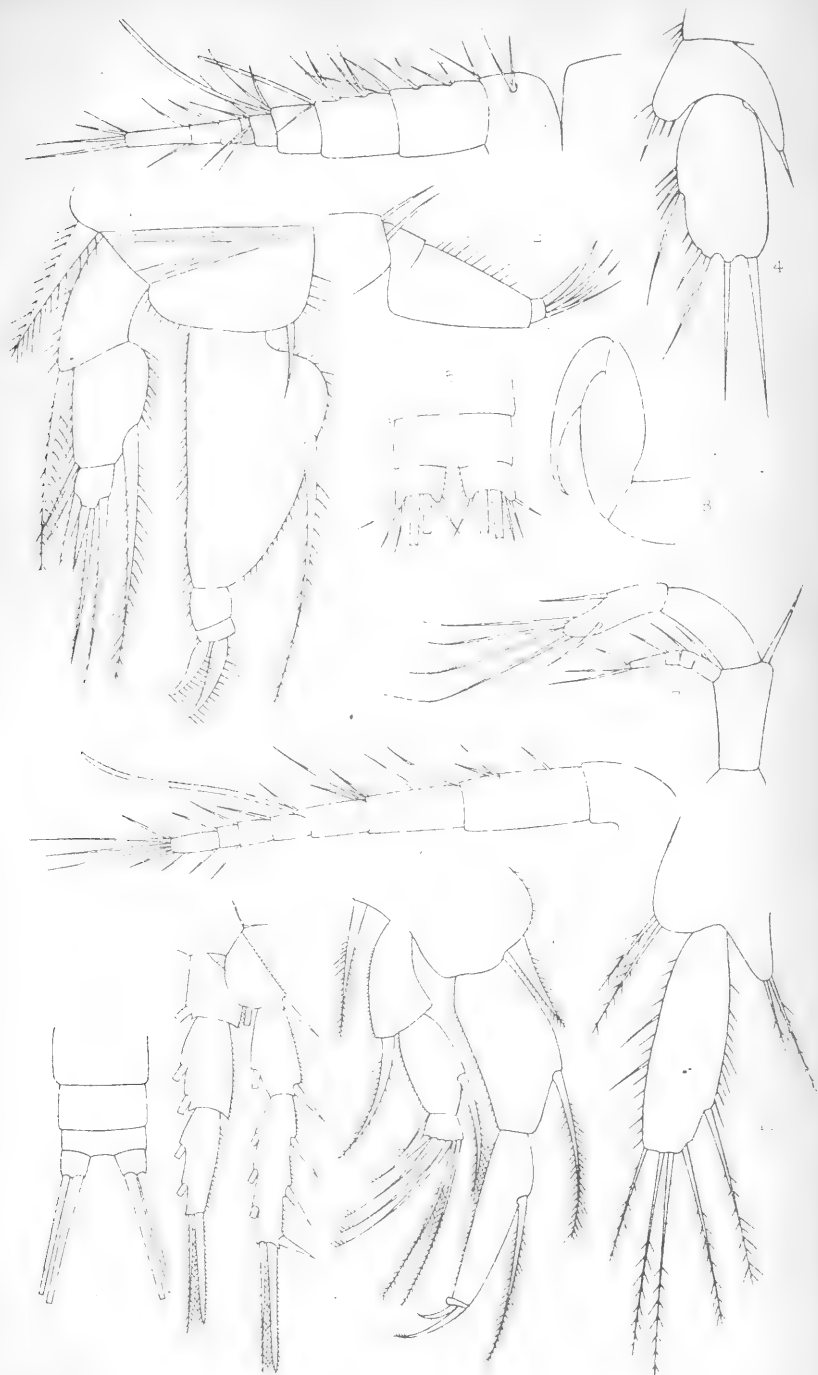








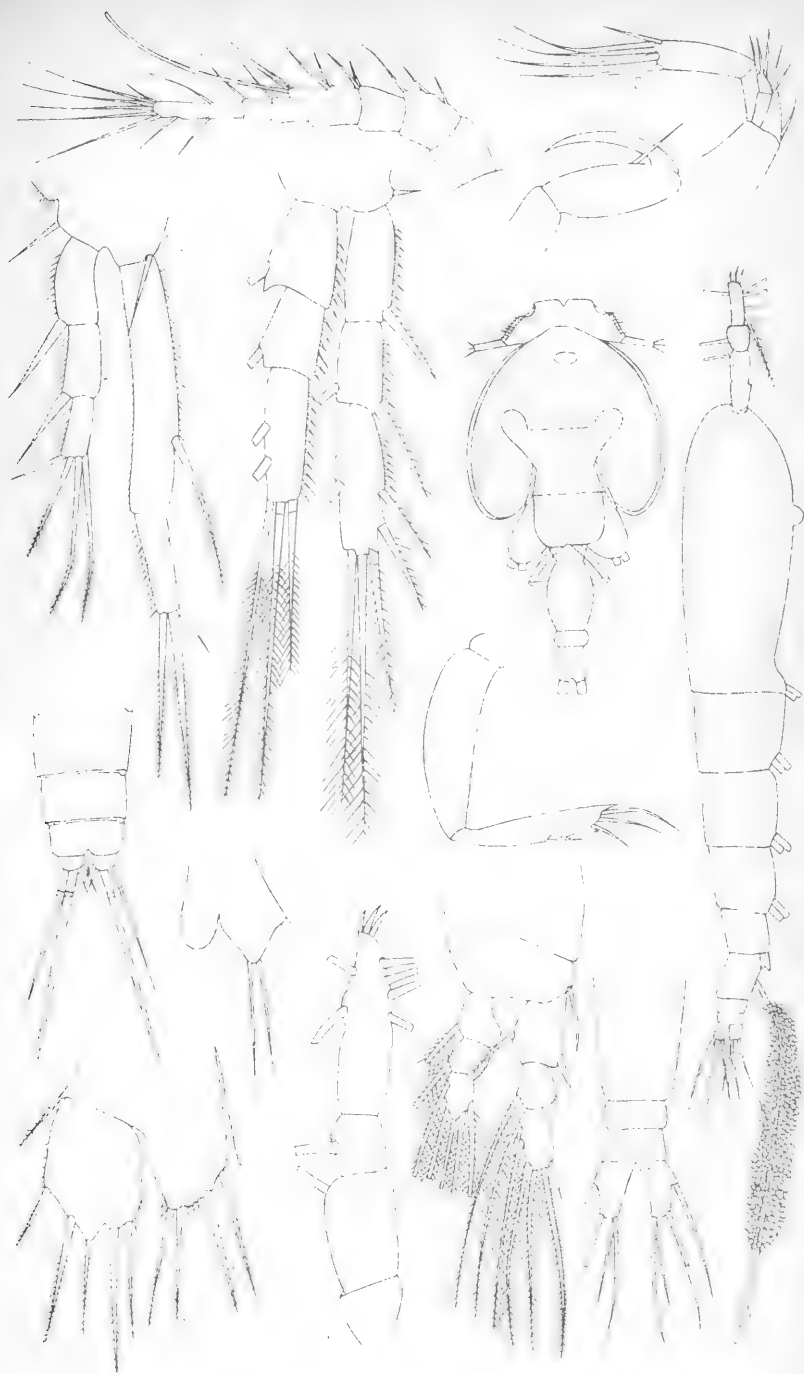






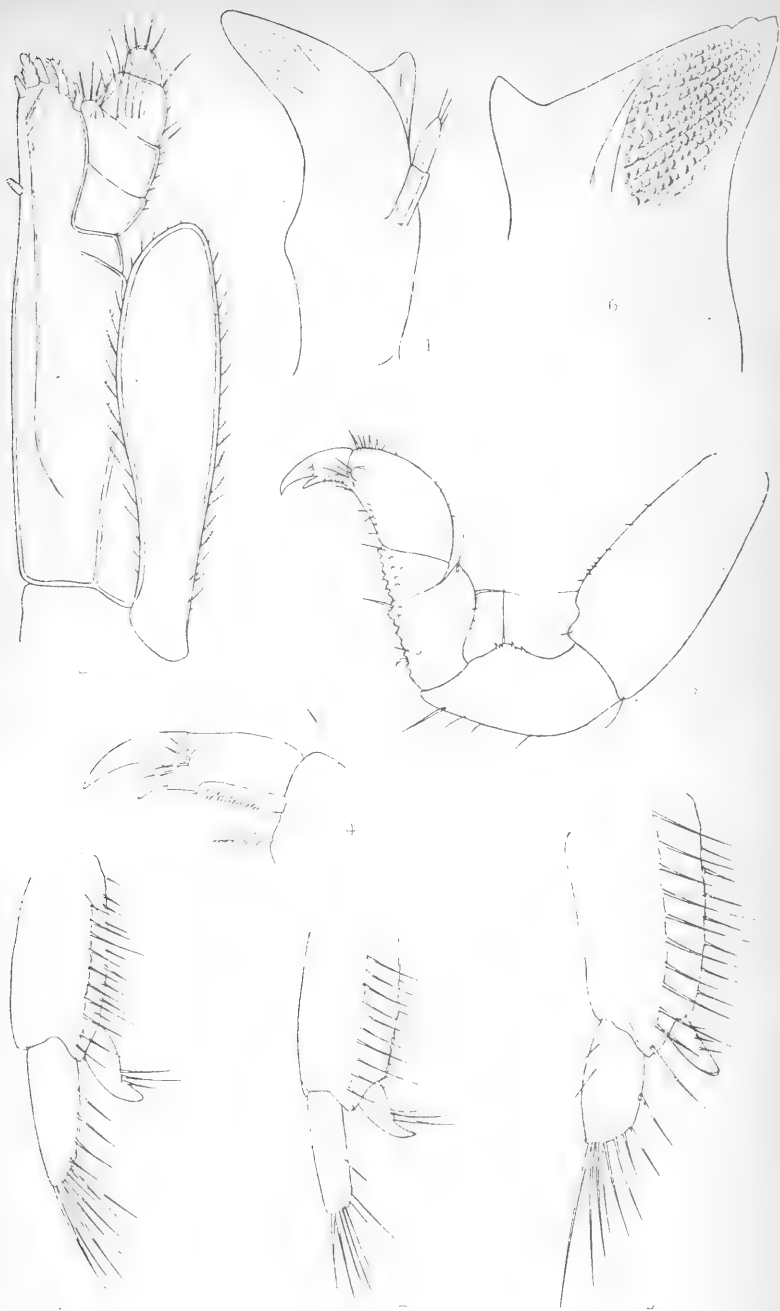








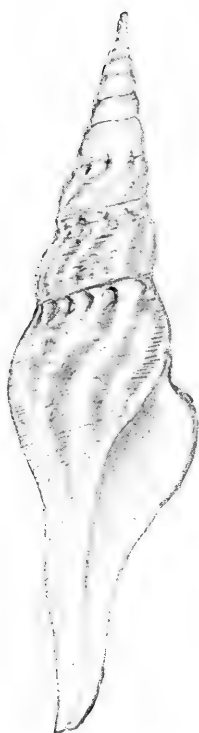
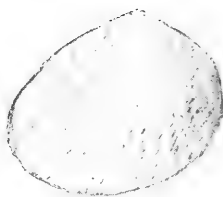




*B. Broadhead & C. Chilton, del.*

Species of LIMNORIA.



**1****2****3**



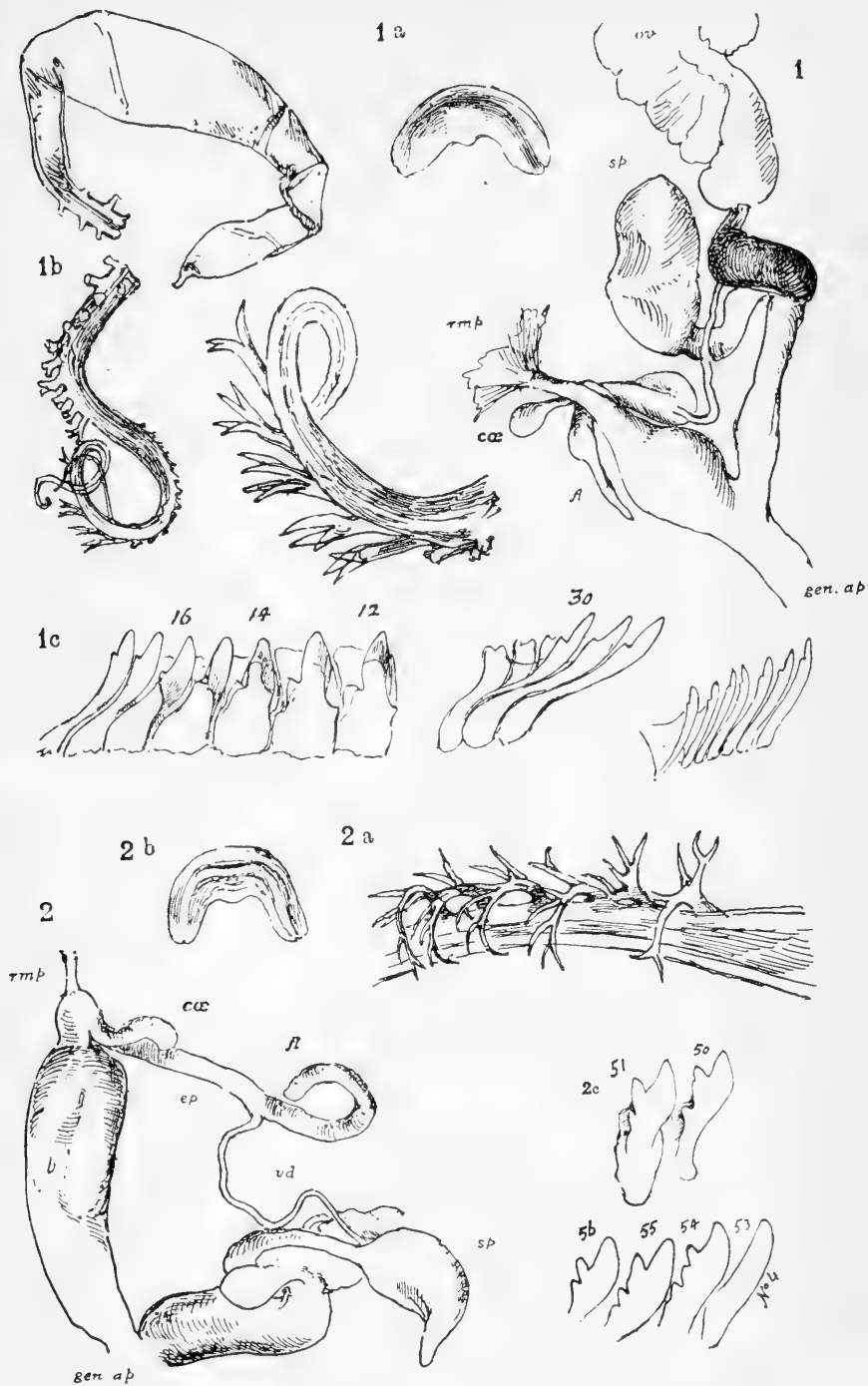


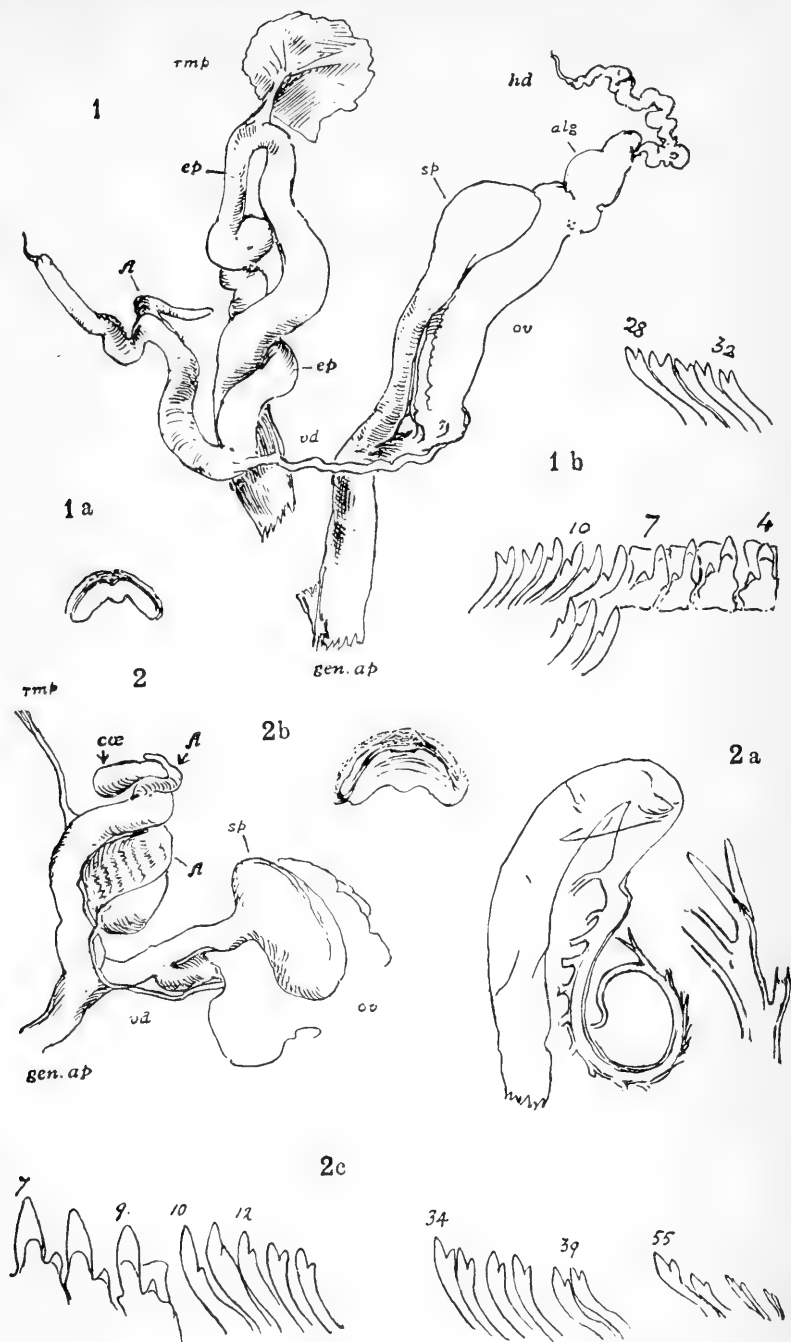
FIG. 1. *Kerkophorus bicolor*.

- No. 3245.

FIG. 2. *Microkerkus symmetricus*, CRAVEN.

- No. 4.

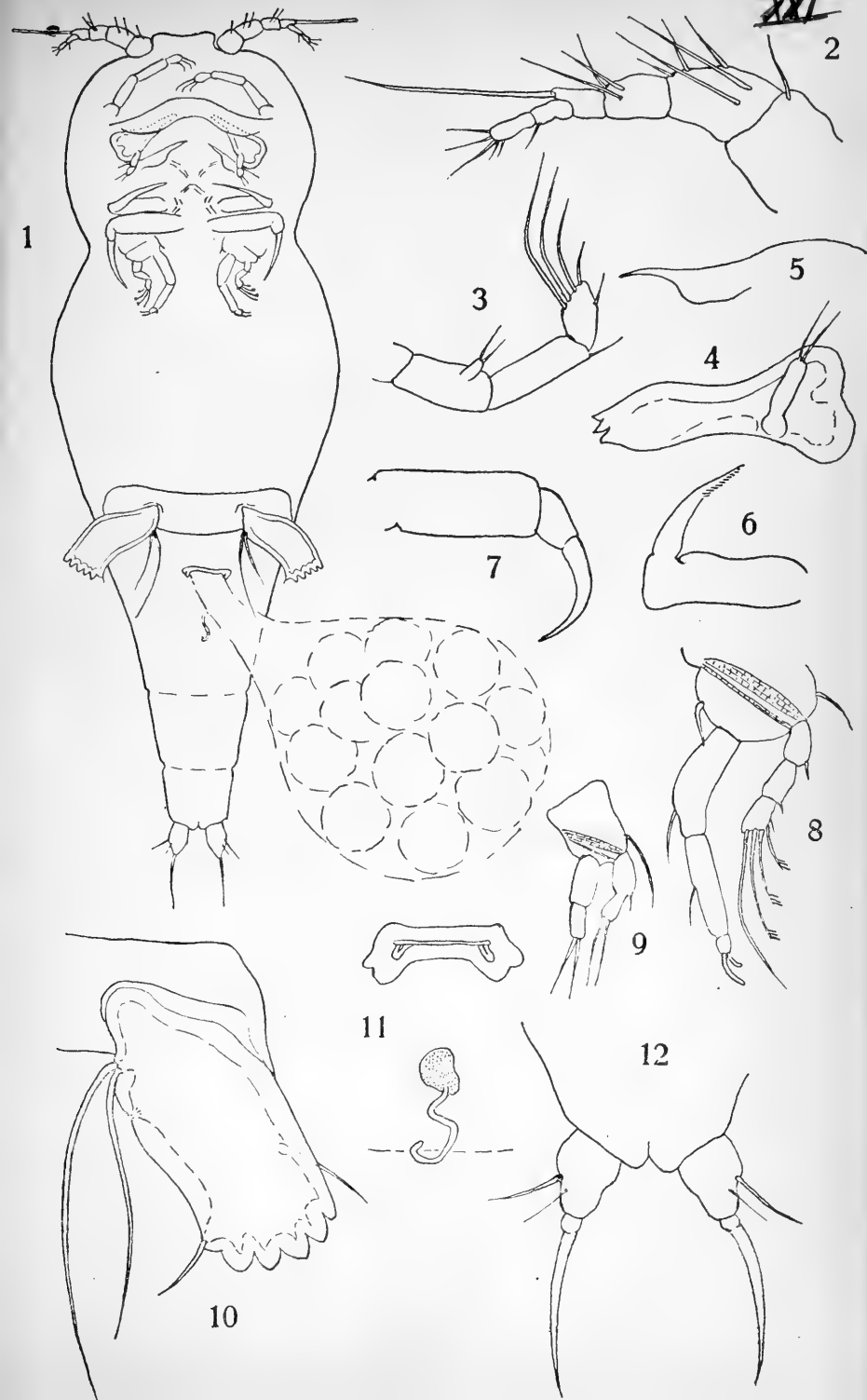




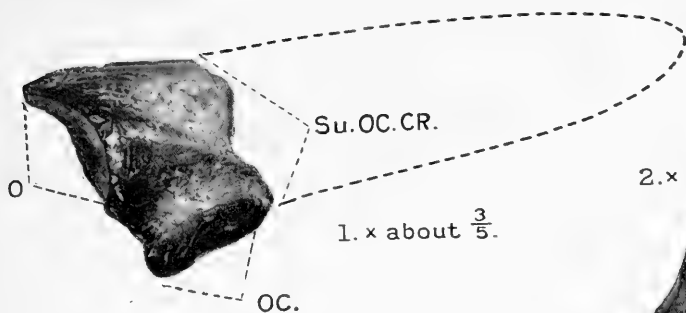
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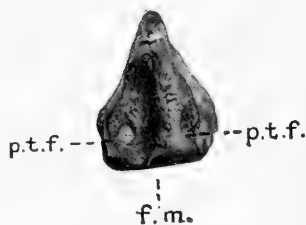








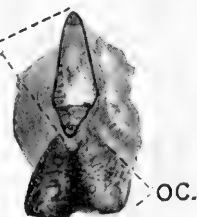
2. x about  $\frac{1}{2}$ .



4. nat. size.

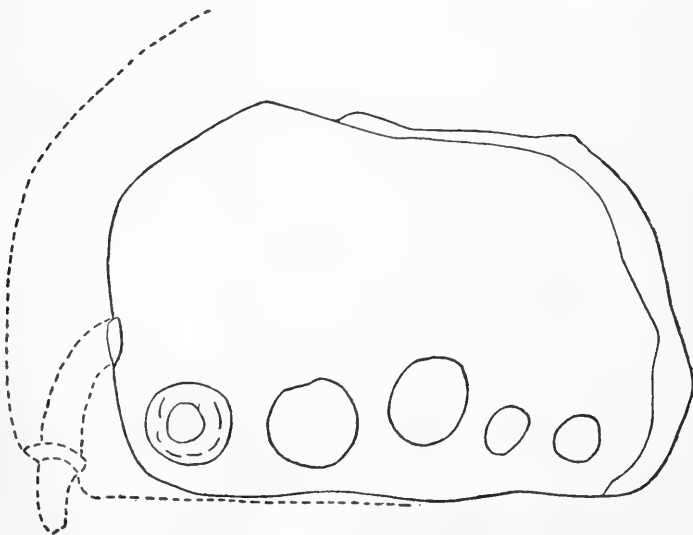


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